LAKE MCDONALD/PARK HEADQUARTERS WASTEWATER TREATMENT SYSTEM REHABILITATION

Final Environmental Impact Statement

GLACIER NATIONAL PARK

A PORTION OF WATERTON – GLACIER INTERNATIONAL PEACE PARK
FLATHEAD AND GLACIER COUNTIES, MONTANA

U.S. DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

August 2000

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Lake McDonald/Park Headquarters
Wastewater Treatment System Rehabilitation
Final Environmental Impact Statement for
Glacier National Park
A Portion of Waterton-Glacier International Peace Park
Flathead and Glacier Counties, Montana

ABSTRACT

This Final Environmental Impact Statement (FEIS) was prepared to address rehabilitation of the wastewater treatment system that currently serves the west side of Glacier National Park (Park). The service area for the existing wastewater treatment plant (WWTP) includes Park Headquarters and residences, campgrounds, Lake McDonald Lodge, and concession businesses and employee housing. The existing WWTP is no longer meeting its original treatment objective or operating at design capacity.

Five alternatives were considered including no action. The preferred alternative (Alternative 3) is to construct an advanced WWTP, with an exfiltration gallery land discharge site. This alternative would provide the greatest level of treatment and the highest water quality of the alternatives considered. Minimal new site disturbance would be necessary to implement the preferred alternative. The existing spray field in the floodplain of the Middle Fork of the Flathead River and McDonald Creek would no longer be used. Alternative 1A includes construction of an additional storage lagoon and a new spray field to discharge treated effluent. This would require clearing 6.5 hectares of undisturbed land and the existing spray field would continue to be used. Alternative 1B includes construction of two new storage lagoons and an additional aerated lagoon (3.6 hectares). The existing spray field would continue to be used. Alternative 2A includes construction of an advanced WWTP and a series of three rapid infiltration basins (3.6 hectares) to discharge treated effluent to the ground water. The existing spray field would no longer be used. The no action alternative (Alternative 4) would continue operation of the existing WWTP and spray field. Occasional raw sewage spills are possible when storage capacity is exceeded and the spray field cannot be operated because of wet conditions.

The details of the alternatives and potential impacts to wildlife, vegetation, and threatened and endangered species and benefits to water quality and Park and concession operations are described in this document and are summarized in Table 2. Estimated costs to implement the alternatives are presented in Table 1. Appendix C includes responses to comments received on the Draft EIS.

A Record of Decision (ROD) for this project will be published 30 days after release of this document. If you have any questions regarding this document, you may contact:

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Summary

Waterton-Glacier International Peace Park is a 4,506 square kilometer National Park that consists of spectacular scenery, designated historic landmarks and cultural properties, proposed wilderness, and a relatively undisturbed ecosystem. The National Park Service (NPS) manages the 4,087-square kilometer Glacier National Park (Park) as a portion of Waterton-Glacier International Peace Park.

The purpose of the proposed project is to rehabilitate and improve the existing wastewater treatment facility to meet Park needs in the Lake McDonald, Apgar, and Park Headquarter areas. The existing wastewater treatment plant (WWTP) was built in 1973 and is no longer meeting its original treatment objective or operating at design capacity. Deficiencies in the existing facility include insufficient lagoon storage, inability to operate year-round, dependence on spray field discharge in a floodplain, a reduction in treatment capacity and efficiency, and the potential for untreated sewage spills. Current project objectives include meeting the demand for wastewater treatment in the Park and reducing potential adverse environmental effects associated with the existing WWTP.

Glacier National Park proposes to replace the existing wastewater treatment system with an advanced wastewater treatment facility that achieves a greater level of nutrient and pathogen removal. The proposed WWTP would incorporate sequencing batch reactors for nitrogen removal combined with chemical and filtration to remove phosphorus. In addition, UV disinfection would be used to kill pathogens prior to discharge. The proposed facility would require enlargement of the existing WWTP building to 18 meters by 30 meters (60 feet by 100 feet). The preferred treated effluent discharge outlet is an exfiltration gallery installed below grade in the 100-year floodplain of the Middle Fork of the Flathead River. Installation of the 30 meter by 30-meter (100 feet by 100 feet) exfiltration gallery would require temporary disturbance of 0.4 hectares (1 acre) of grassland meadow. Treated effluent discharges would meet Montana Department of Environmental Quality (MDEQ) non-degradation water quality requirements. Construction of the proposed facility would cost about $3.75 million dollars and would take 2 years to construct beginning in 2001.

Several alternative wastewater treatment systems were evaluated in the FEIS. Alternatives 1A and 1B would continue to use a lagoon treatment system similar to the existing facility. Alternative 1A would add an additional aerated lagoon plus a new 5.3-hectare (13-acre) spray field outside of the 100-year floodplain. Treated effluent discharge would occur in the existing and new spray fields during the summer; during the winter, sewage would be stored in holding ponds. Alternative 1B would add additional lagoons for winter sewage storage until the existing spray field

is operational in the late spring or early summer. This alternative would require disturbance of about 6.5 hectares (16 acres) of new land for construction of additional storage lagoons.

Alternative 2 is an advanced water treatment facility similar to the preferred alternative, but does not include the chemical and filtration treatments for phosphorus removal. This facility would use a series of three rapid infiltration basins to discharge the treated effluent to ground water in a terrace outside of the 100-year floodplain. About 3.6 hectares (9 acres) of forest would need to be cleared to construct the infiltration basins. Each of the alternative wastewater treatment options would meet Montana DEQ water quality discharge standards.

The No Action alternative would continue operation of the existing WWTP and spray field. Because this facility is no longer treating to original design criteria, biological oxygen demand and suspended sediment concentrations would continue to increase. Occasional sewage spills from the lagoon may occur during wet springs when storage capacity is exceeded and the spray field cannot be operated. To reduce the potential for spills, it may be necessary to restrict Park or concession operations in the winter or early spring. The current facility would continue to meet state water quality requirements.

Public involvement included four open houses in West Glacier and Kalispell to solicit input on the proposed project and comments on the Draft EIS. A total of 15 comments were received on the Draft EIS; one comment was a petition with 108 signatures. Public comments on the Draft EIS were generally supportive of the Park's plan for an advanced water treatment system. However, concerns were expressed with the location and type of discharge site to use for the treated effluent, potential impacts to the Wild and Scenic River values of the Middle Fork of the Flathead River, possible effects to the Middle Fork floodplain, and potential water quality effects to the Middle Fork. Other issues included possible impacts to wetlands or threatened and endangered species, questions about WWTP reliability, and concern with possible expansion of winter concessions. Responses to these concerns have been incorporated in the text of the Final EIS and addressed directly in *Appendix C: Response to Comments*.

The intent of this Final EIS and the proposed project is to rehabilitate the existing wastewater treatment facility and provide the Park with a technically advanced wastewater treatment facility that will minimize impacts to the environment and serve the Park for at least the next 20 years.

1.0 Purpose and Need

Waterton-Glacier International Peace Park is a 4,506 square kilometer National Park that consists of spectacular scenery, designated historic landmarks and cultural properties, proposed wilderness, and a relatively undisturbed ecosystem (Figure 1). The National Park Service (NPS) manages the 4,087-square kilometer Glacier National Park (Park) as a portion of Waterton-Glacier International Peace Park.

In 1932, the Canadian Parliament and United States Congress designated Glacier National Park and Waterton Lakes National Park as Waterton-Glacier International Peace Park. In 1974, about 95 percent of Glacier National Park was identified as suitable for preservation as wilderness in the National Wilderness Preservation System. Although Congress has not formally designated it as wilderness, the Park is managed as wilderness until Congress formally designates or rejects it. In 1976, the United Nations designated Waterton-Glacier International Peace Park as a biosphere reserve. In 1995, the United Nations designated Waterton-Glacier International Peace Park a World Heritage Site.

The purposes of Glacier National Park are to:

- Preserve and protect natural and cultural resources unimpaired for future generations.
- Provide opportunities to experience, understand, appreciate, and enjoy Waterton-Glacier International Peace Park consistent with the preservation of resources in a state of nature.
- Celebrate the ongoing peace, friendship, and goodwill among nations, recognizing the need for cooperation in a world of shared resources (NPS 1998a).

The purpose of the proposed project is to rehabilitate and improve the existing wastewater treatment facility to meet Park needs in the Lake McDonald, Apgar, and Park Headquarter areas. The existing wastewater treatment plant (WWTP) was built in 1973 and is no longer meeting its original treatment objective or operating at design capacity. Current project objectives include meeting the demand for wastewater treatment in the Park and reducing potential adverse environmental effects associated with the existing WWTP.

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Figure 1. Project vicinity.

Insert Figure 1

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Current visitor use in Glacier National Park is about 1.7 million people per year, with a peak demand on the wastewater treatment system of 410,000 visitors per month during the summer. The existing WWTP includes a sewage treatment lagoon, a wastewater treatment building, and a 23-hectare (58-acre) irrigation spray field for discharge of treated effluent. The existing wastewater treatment system has exceeded its 20-year design life and lacks the capacity and flexibility to maintain and operate in an efficient manner in the future due to several deficiencies:

- The existing WWTP is 27 years old and is no longer operating at the level of treatment and efficiency as originally designed.
- The existing wastewater facility is no longer capable of operating at its original design capacity of 250,000 gallons per day.
- The existing sewage storage lagoon is used to store effluent throughout the winter until the spray field is operational during the summer. The capacity of the existing storage lagoon is inadequate to store winter flows and precipitation during wet years.
- The storage capacity of the sewage lagoon has decreased over time with the accumulation of solids at the bottom of the lagoon. Removal of sludge deposits in the existing lagoon is difficult because the system cannot be shut down for maintenance.
- Snow cover and/or a high water table prevent winter or early spring applications of treated effluent to the spray field. In the spring of 1992, the spray field was covered with snow and effluent and the lagoon exceeded storage capacity. This resulted in a breach in the sewage lagoon dike and the discharge of partially treated sewage effluent to the environment.
- The existing spray field irrigation system has deteriorated and is no longer able to reliably discharge treated effluent without rehabilitation or use of an alternate treatment system.

Failure to improve the existing wastewater facility may result in surface and ground water contamination, harm to aquatic and other natural resources, and restrictions in the operation of Park Headquarters, residences, and concessioner businesses during the winter and early spring. The proposed project and alternatives discussed in this Final Environmental Impact Statement (FEIS) would correct the existing wastewater facility deficiencies.

Glacier National Park proposes to replace the existing wastewater treatment system with an advanced wastewater treatment facility that achieves a greater level of nutrient and pathogen removal. The proposed improvements would restore the original design capacity of 250,000 gallons per day and accommodate existing services, a planned visitor

facility (Discovery Center and Museum) discussed in the Park General Management Plan (NPS 1999a), and existing private inholdings in the Lake McDonald area. Because existing peak WWTP demand is less than 65 percent of the original design capacity, restoration to the original capacity is expected to meet demand for at least the next 20 years. All proposed improvements are in the vicinity of the existing wastewater facility (Figure 2).

This FEIS analyzes the potential effects to the environment from the preferred alternative, alternative actions, and no action. The FEIS has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 and the NEPA regulations of the Council on Environmental Quality (40 CFR 1500). Public comments received on the Draft Environmental Impact Statement were reviewed and considered in completing the Final Environmental Impact Statement. The selection of an alternative, mitigation measures, and the decision rationale will be documented in a Record of Decision (ROD) 30 days after release of the FEIS.

This FEIS is divided into nine chapters. The following sections in the Purpose and Need chapter discuss the background for this project, issues identified during scoping, and impact topics covered in this FEIS. Chapter 2 addresses alternatives that were considered to meet the purpose and need of this project. Chapter 3 discusses the affected environment, and Chapter 4 discusses the environmental consequences of the alternative actions. Chapter 5 covers consultation and coordination with the public and resource agencies. Chapter 6 addresses compliance with federal and state regulations. Chapter 7 lists agencies, organizations, and persons receiving the FEIS. Chapter 8 includes references, and Chapter 9 lists the preparers of this FEIS.

Figure 2. Project area.

Insert Figure 2.

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1.1 Background

Glacier National Park attracts about 1.7 million visitors annually. Approximately 60 percent of these visitors enter and receive information on the west side of the Park and are served by the Lake McDonald wastewater treatment facility. The Lake McDonald wastewater treatment facility also currently serves about 300 concession employees, 200 Park employees and their families, concession operations, Lake McDonald Lodge, Apgar Village, Sprague Creek, Apgar, and Fish Creek Campgrounds, Park Headquarters, and maintenance areas. During the winter, the WWTP primarily serves the Park Headquarters and Park employee residences.

In 1973, the Park identified a number of improvements that were needed to address pollution sources to Lake McDonald from the seepage of raw sewage from existing septic systems, inadequate secondary treatment facilities, and deficiencies in the wastewater collection system. The existing aerated lagoon and effluent disposal spray field were constructed as part of the 1973 improvements. The original system was designed for a peak demand of 250,000 gallons per day (gpd).

In 1996, the Park determined that improvements and upgrades to the wastewater facility and collection system were needed to meet Park existing and future demands. As described below, this can be accomplished by restoring the original treatment capacity to the WWTP. In addition, improvements are needed to protect Park resources from accidental wastewater discharges. A number of needed improvements to the wastewater system were identified, including improving treatment and increasing storage capacity of the treatment system, replacing or rehabilitating older service-intensive lift stations, and slip lining or replacing failed or damaged collection lines. Since 1997, the Park has upgraded lift stations at Lake McDonald and Sprague Creek, and has replaced several lines. The Park's ongoing maintenance program is continuing sewage collection line inspections and improvements as necessary to improve the efficiency of the sewage collection facility. This FEIS addresses proposed improvements to the wastewater treatment facility, but does not address all of the anticipated future maintenance and updating of the sewage collection system. Future actions to repair damaged sewage collection lines and other lift station improvements will be addressed during on-going maintenance and replacement activities as funding allows.

1.2 Issues and Public Involvement

Scoping meetings were held with an interdisciplinary team (IDT) of Park staff, consultants, state and local agencies to identify potential alternatives and issues. Two public open houses were held in Kalispell and West Glacier, Montana to solicit input on the project. The scoping and planning process resulted in the identification of a number of issues, concerns, and opportunities to be addressed in the Draft EIS. A summary of these issues is discussed below. Chapter 5.0 provides additional information on scoping and identification of issues. A number of comments were received on the Draft EIS, which was released in January 2000. Appendix C includes comment letters and the Park Service's response to these comments. Where appropriate, the text in the Final EIS has been revised.

The public comments on the draft Environmental Impact Statement expressed several common concerns. Some members of the public questioned why the existing capacity was not being increased to accommodate perceived increases in sewage due to the West Side Discovery Center and adding private homes along Lake McDonald to the system. The analysis conducted by RTW (1999) indicated that although the current treatment system was designed to operate at a peak capacity of 250,000 gallons per day, peak recorded WWTP inflows were still less than 65 percent of capacity. Their analysis further indicated that if the system could be rehabilitated to operate at 250,000 gallons per day, this capacity would be enough to accommodate the West Side Discovery Center and the addition of private inholders along Lake McDonald.

Many members of the public also were concerned about the proposal to pipe the treated effluent to the Middle Fork of the Flathead River due to its status as a Wild and Scenic River and the perception that the National Park Service was dumping sewage into the river, despite the level of treatment the water was receiving. In response, the National Park Service has selected the exfiltration gallery system as its preferred alternative for discharge of the treated effluent. This method would pipe the treated effluent to a location about 30 meters (100 feet) from the river. The effluent would be dispersed into the ground below the surface. The effluent would pass through a concrete box before being released into the ground where it would then filter down through gravel and sand before entering the ground water system. The exfiltration would be located entirely below the ground surface and would not affect flooding hazard.

Many members of the public who commented also strongly suggested that the Park consider using a constructed wetland or cattail pond to treat and distribute the treated effluent. An evaluation of this method concluded that a constructed wetland would not improve the quality of the treated discharge. A wetland would only be functional during a relatively short growing season, and wide fluctuations in discharge to a wetland would

make it difficult to size and efficiently operate a wetland system. In addition, a wetland would require greater disturbance and a change in the natural habitat.

Facility Operation

The existing 27-year old WWTP no longer operates at its original designed capacity of 250,000 gpd and cannot operate year-round due to snow and the need for plant uptake. WWTP discharges to the spray field in the spring often are not possible due to saturated ground conditions. The aging facility is no longer meeting its original treatment objectives.

Water Quality

The potential effect to water quality from alternative methods of wastewater treatment is an issue of concern. The public is concerned with using the best available technology to treat wastewater and maintain high water quality in receiving waters. Potential downstream effects to Flathead Lake water quality also is an issue. Continued operation of the existing facility may result in periodic breaches of the sewage lagoon, which could affect water quality in lower McDonald Creek and the Middle Fork of the Flathead River and ultimately Flathead Lake.

Floodplain

Floods or saturated conditions in the floodplain prevent the use of the existing spray field and can affect the operation of the wastewater treatment system. Current state regulations do not allow new effluent spray fields to be located within a 100-year floodplain.

Wild and Scenic Rivers

The Middle Fork of the Flathead River is a Wild and Scenic River adjacent to the existing WWTP. An issue of concern is the potential impacts to the scenic and natural resource values of this segment of the Wild and Scenic River.

Wildlife

Under some alternatives, additional land is needed to construct more sewage lagoons or a new spray field. Project actions could affect habitat used by elk, deer, black bear, and a variety of other mammals, birds and wildlife.

Aquatic Life

Subaquatic organisms, referred to as the hyporheic community, are likely present in the alluvial ground water of lower McDonald Creek and the Middle Fork of the Flathead River. Continued use of the existing spray field, new spray fields or discharge basins in the vicinity of the these drainages would introduce nutrients that may affect the hyporheic community.

Threatened, Endangered and State Sensitive Plants and Wildlife

Glacier National Park is one of the most ecologically intact areas in the world and provides habitat for a wide diversity of plant and animal life. Five federally listed threatened and endangered species—grizzly bear, bald eagle, lynx, gray wolf and bull trout—are found in the Park and use habitat in the vicinity of the wastewater treatment facility. Velvetleaf blueberry, a state threatened plant, is found in the vicinity of the existing sewage lagoon and potential expansion sites. There is concern that construction activity and a loss or change in habitat could affect threatened or endangered wildlife or state sensitive plants.

Socioeconomics

The continued operation of Park west side facilities including campgrounds, the Discovery Center, concessions, Lake McDonald Lodge, Park Headquarters, Park operations, and private businesses in Apgar are dependent on a reliable wastewater treatment facility. In addition, the west-side Park employee residences require service from the wastewater treatment facility.

Current limitations in effluent storage capacity could result in restricted use of some Park facilities in the winter to reduce the wastewater treatment demand. This could affect Park operations. In addition, economic impacts to Park concessioners and private businesses in the Park are possible with the existing wastewater treatment facility. This is most likely to occur during operational startup in the spring.

Cultural Resources

Known cultural resources near the project area were considered by Park staff, with the examination of existing cultural resource inventories, to determine whether cultural resources would be an issue. No cultural resources were found in the alternative and preferred project areas.

1.3 Impact Topics

Major issues that relate to the purpose and need of the proposed project to improve the wastewater treatment system are discussed in detail in the FEIS. Resource issues or concerns with minor or no effects are not discussed in detail. Impact topics selected or eliminated from detailed discussion are listed below.

Impact Topics Selected for Detailed Analysis

Impact topics that were selected for detailed analysis include soils, water resources and floodplains, Wild and Scenic Rivers, vegetation, wildlife and aquatic resources, threatened, endangered, and sensitive species, visual resources, noise and odor, visitor use and experience, land use, and local and regional economy.

Impact Topics Dismissed from Detailed Study

Air Quality

Air quality is not discussed in detail in this document because potential effects are expected to be minor. There would be a small increase in hydrocarbon emissions associated with construction equipment during construction. This would be a short-term effect and would not adversely affect air quality in the Park. An air quality monitoring station is located near the existing wastewater facility, but construction activities or operation of any of the alternatives would not affect monitoring activities. Spray field applied effluent could potentially contain air-borne pathogens not killed during the treatment process. Spray field sites would be fenced to prevent access to these areas. No effects to air quality would occur under the no action alternative, and none of the alternatives would result in long-term or cumulative adverse effects.

Wetlands

No wetlands were identified in the potential area of disturbance for this project. The U.S. Army Corps of Engineers (2000) verified the absence of wetlands in the proposed project area. The floodplain area is generally well drained although surface water is present during spring snowmelt or flood events. Project lands on the terrace slopes above the floodplain support upland vegetation. McDonald Creek and the Middle Fork of the Flathead River are a waters of the U.S. subject to regulation by the U.S. Army Corps of Engineers.

Construction of the proposed WWTP, pipelines and discharge outlet would not affect wetlands or waters of the U.S. Installation of the

proposed exfiltration gallery in the floodplain of the Middle Fork of the Flathead River would be located to avoid wetlands. There are no wetlands in the vicinity of disturbances associated with the other action alternatives. Under the no action alternative, wetlands or waters of the U.S. would not be affected. No cumulative wetland effects were identified for any of the alternatives.

Prime or Unique Farmland

No prime or unique farmland is present in Glacier National Park. There would be no impact to this resource for any of the alternatives.

Cultural Resources

Intensive cultural resource surveys by Park archeologists of the project area did not locate any cultural resources. There are two known sites in the vicinity of the project, but they are outside any anticipated disturbance areas for any of the alternatives. These sites are unlikely to be eligible for listing on the National Register of Historic Places (NRHP). The proposed project would not be an "undertaking" that would require Section 106 of the National Historic Preservation Act review. No long-term or cumulative effects would be associated with the alternative actions. The Montana State Historic Preservation Office concurred that no properties on or eligible for the NRHP appear likely to exist within the project impact area (Appendix C).

Environmental Justice

None of the alternatives would adversely affect environmental justice because potential actions would not affect minority or low income populations disproportionately. All populations would be affected equally.

Energy Consumption

Construction equipment use would result in increased energy consumption during construction. Pumps and machinery associated with treatment plant operation would result in minor long-term increases in energy consumption for each of the alternatives. The advanced wastewater treatment alternatives would have the highest energy demand and the new sewage lagoons and spray fields would have the lowest energy demand. There are no known cumulative impacts on energy consumption from alternative actions.

2.0 Alternatives Including the Preferred

The project area is located in the lower McDonald Valley at an elevation of about 965 meters (3,150 feet) (Figure 2). The project area includes the relatively flat floodplain of lower McDonald Creek and the Middle Fork of the Flathead River and the upland stream terrace located above the floodplain. The existing wastewater treatment sewage lagoon and associated structures are located on the upper terrace and the spray field is located in the floodplain. Alternative wastewater treatment plant facilities would be located in the upper terrace outside of the floodplain. For some alternatives, however, the existing spray field in the floodplain would remain in use. The Preferred Alternative would have a discharge outlet in the floodplain.

Development of alternatives for improvements to the existing wastewater facility involved the efforts of an interdisciplinary team of Park scientists, engineers, consultants, and input from the public (RTW 1999). Through this process, four alternatives were identified for evaluation as part of the FEIS and are discussed below. The lack of storage capacity in the existing sewage lagoon and seasonal limitations in the application of treated effluent to the spray field has reduced the original treatment capacity. Each of the four action alternatives would meet the purpose and need for improvements to the wastewater treatment plant and would have a design capacity of 250,000 gpd, which is the same as the original design capacity of the existing operation. The key characteristics of each alternative are summarized in Table 1. Additional alternatives that were considered, but eliminated from detailed study for various reasons, are also briefly discussed. A discussion of the alternative selection process is included in Section 2.7. Mitigation measures common to all alternatives are included in Section 2.8.

2.1 Actions Common to All Alternatives

The Park Service has initiated and will continue to implement several measures to improve the operation of the sewage collection system and conserve water. These measures are common to all alternatives and include:

- Continued installation of low-flow plumbing fixtures throughout the Park.
- Continue the requirement for concessioners to install low-flow fixtures.
- Performance of a TV inspection of wastewater collection lines to determine the extent and location of ground water infiltration and surface water inflow to the wastewater collection system.
- Repair or replace water lines throughout the Park.

2.2 Alternative 1A — Lagoon Treatment, Sprinkler Discharge, Additional Spray Field

This alternative would use the existing treatment plant in its current layout and discharge configuration, and incorporate the addition of one aerated treatment lagoon and an additional spray irrigation area. A new 4.3-million gallon aerated lagoon (1.2 hectares [3 acres] fenced) would be located immediately to the east of the existing treatment plant (Figure 3). The new lagoon would serve as additional storage for early season flows when discharge to the existing spray irrigation system within the floodplain is not possible due to saturated ground conditions. In addition, the new lagoon would also provide a greater level of treatment while providing operational flexibility during dry season conditions.

The existing spray field in the 100-year floodplain would remain in use. A new 5.3-hectares (13-acre) spray irrigation site would be located north of the existing plant site to minimize impact to the state threatened velvetleaf blueberry. The new spray irrigation system area would allow land application of wastewater effluent at a reduced capacity when early spring conditions prohibit the use of the existing spray irrigation field. Treated effluent discharges would be in compliance with MDEQ requirements. A wooden or smooth wire fence would be used to prevent unauthorized access. The fence would not restrict access for most wildlife.

This treatment alternative also would include replacing the existing sewage lagoon liner, installing new spray heads for the existing irrigation system, constructing a new headworks facility, and upgrading the existing blower and pumping systems. Construction of this alternative would take about 2 years beginning in 2001.

Estimated capital and annual operating costs for the alternatives are shown in Table 1. The design life used in the cost estimates is 20 years for mechanical equipment and 50 years for structures. A new spray field and lagoon under Alternative 1A would cost about $2.15 million. Annual operating costs for this facility would be about $161,700 per year and 1.5 staff operators would be required.

Table 1. Comparison of alternative WWTP characteristics.[†]

Resource	Alternative 1A Lagoon Treatment, Sprinkler Discharge, Additional Spray Field	Alternative 1B Lagoon Treatment, Sprinkler Discharge, Additional Storage	Alternative 2 Advanced WWTP, Rapid Infiltration Basin Discharge	Alternative 3 Preferred Alternative Advanced WWTP, Land Discharge	Alternative 4 No Action
TREATMENT TYPE	Lagoon	Lagoon	Advanced WWTP • Activated sludge • UV disinfection	Advanced WWTP • Activated sludge • UV disinfection • Chemical and filtration treatment	Lagoon
DISCHARGE TYPE	Existing floodplain spray field and new spray field outside of floodplain	Existing floodplain spray field	Infiltration basin to ground water outside of floodplain	Land discharge to alluvial ground water in floodplain •	Existing floodplain spray field
DISCHARGE SEASON	Spring, summer, fall	Spring, summer, fall	Year-round	Year-round	Spring, summer, fall
STATUS OF EXISTING SPRAY FIELD	Remains in operation	Remains in operation	No longer used	No longer used	Remains in operation
NEW DISTURBED AREA	6.5 hectares (16 acres)	3.6 hectares (9 acres)	3.6 hectares (9 acres)	0.04 hectares (0.1 acres) (and 0.4 hectares (1 acre) of temporary disturbance	0
NEW SPRAY FIELD AREA	5.3 hectares (13 acres)	0	0	0	0
TOTAL AREA REQUIRED INCLUDING EXISTING SPRAY FIELD AND LAGOON	32 hectares (79 acres)	26 hectares (64 acres)	3.6 hectares (9 acres)	2 hectares (0.8 acres) (plus 0.4 hectares (1 acre) of temporary disturbance	24 hectares (59 acres)
TOTAL CAPITAL COST	$2,148,900	$2,063,100	$2,999,900	$3,752,600	N/A
TOTAL ANNUAL OPERATING COST[‡]	$161,700	$155,400	$207,900	$223,000	$26,000

[†]Water conservation actions common to all alternatives are discussed in Section 2.1

[‡]Annual costs are based on the midpoint operating costs applied over 20 years.

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Figure 3. Alternative 1A — Lagoon treatment, sprinkler discharge, additional spray field.

Insert Figure 3.

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2.2 Alternative 1B — Lagoon Treatment, Sprinkler Discharge, Additional Storage

This treatment alternative would continue to use the existing treatment lagoon and spray field in the 100-year floodplain for discharge of wastewater effluent. No additional spray irrigation fields are proposed and there would be no change in the size of the existing spray field. Treated effluent discharges would be in compliance with Montana DEQ requirements. To correct limitations in the use of the existing spray field during the early spring, three additional storage and aerated lagoons would be constructed. Two new seasonal storage lagoons, each with a 5-million gallon storage capacity, would be located directly west and north of the existing treatment site (Figure 4). The new seasonal storage lagoons would increase the storage capacity of the system and capture high inflows during the summer months. In addition, a new 4.3 million-gallon aerated lagoon would be located immediately east of the existing treatment plant (Figure 4). This new aerated lagoon would provide a greater level of treatment while providing operational flexibility. The new lagoons would require 3.6 hectares (9 acres) of land to construct and would be sited to minimize impacts to the state threatened velvetleaf blueberry located in the vicinity.

This alternative also would include replacing the existing sewage lagoon liner and spray heads for the irrigation system, installing a new headworks facility, and upgrading of the existing blower and pumping systems. A 2-meter (6-foot) chain link fence would be constructed around the perimeter of each lagoon to prevent unauthorized access. About 3.6 hectares (9 acres) would be included within the perimeter of the fenced lagoons. Construction of this alternative would take about 2 years beginning in 2001.

The estimated cost of a new sewage lagoon and rehabilitation of the existing spray field for Alternative 1B is $2.06 million (Table 1). Annual operating costs would be $155,400 and 1.5 staff operators would be required.

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Figure 4. Alternative 1B — Lagoon treatment, sprinkler discharge, additional storage.

Insert Figure 4.

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2.3 Alternative 2 — Advanced Wastewater Treatment Plant, Rapid Infiltration Basin Discharge

This treatment option departs significantly from the previous alternatives in that treated effluent would be disposed of via rapid infiltration basins (RIB). An advanced wastewater treatment process employing sequencing batch reactor (SBR) technology would be used to achieve a high level of total nitrogen removal to prevent any increase in the existing background nitrate levels in ground water. This treatment would use an activated sludge process in a single vessel to remove total nitrogen to required limits. In addition, UV disinfection would be incorporated in the design to kill pathogens prior to discharge. A 18-meter by 24-meter (60-feet by 80-feet) treatment building would house at least two SBR tanks and all necessary pumps, blowers, piping, valves and controls for a complete working system.

Effluent from the treatment process would be applied to three different rapid infiltration basins where the wastewater would percolate through subsurface soils before contacting ground water (Figure 5). Two 0.56-hectare (1.4-acre) and one 0.60-hectare (1.5-acre) infiltration basins would be constructed. Three RIBs are required to provide adequate rest periods between effluent applications to each basin. Treated effluent discharges would be in compliance with Montana DEQ requirements. In this alternative, the RIBs would be located north of the existing plant to minimize effects to the state threatened velvetleaf blueberry plant (Figure 5). A 2-meter (6-foot) chain-link fence around the perimeter of the infiltration basins would encompass 3.6 hectares (9 acres).

The existing lagoons would be used as waste holding and equalization ponds to hold waste sludge generated from the SBR process. Wastewater low in solids concentration would be decanted off the ponds and processed with the raw wastewater through the SBR process. Waste sludge accumulating in the bottom of the pond would be removed on a bi-annual basis through the use of a floating sludge dredge and hauled out of the Park by a private contractor to an approved land fill in accordance with all Environmental Protection Agency and MDEQ requirements. Additional pipelines would be installed to connect different facility components. The existing spray field would no longer be used. Construction of this alternative would take about 2 years beginning in 2001.

Construction of an advanced WWTP and rapid infiltration basin in Alternative 2 would cost about $3.0 million (Table 1). Increased costs for this facility are related to the construction of a new building with batch reactors, UV disinfection system, and the infiltration basins. This facility would require two full-time operators and would have an annual operating expense of $207,900.

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Figure 5. Alternative 2 — Advanced wastewater treatment, rapid infiltration basin discharge.

Insert Figure 5.

Back of Figure 5.

2.4 Alternative 3 — Preferred Alternative — Advanced Wastewater Treatment Plant, Land Discharge

This treatment option would incorporate the highest level of treatment of all the alternatives considered (Figure 6). Under Alternative 3, SBR technology for nitrogen removal (discussed under Alternative 2) would be combined with chemical additions and filtration to remove nitrogen and phosphorous. Chemical treatment for phosphorus removal would be used due to the desire to meet non-degradation water quality standards. In addition, UV disinfection would be used to kill pathogens before discharge.

Water treatment plant modules would be used to treat effluent. Installing water treatment plant modules would require enlarging the existing treatment plant building to 18 meters by 30 meters (60 feet by 100 feet) to house and protect all the treatment equipment for year-round operations. Waste sludge accumulating in the bottom of the pond would be removed on a bi-annual basis through the use of a floating sludge dredge and hauled out of the Park by a private contractor to an approved land fill in accordance with all Environmental Protection Agency and MDEQ requirements. The existing spray field would no longer be used.

As in the case with all the previous alternatives, this treatment alternative also would include replacing the existing sewage lagoon liner, constructing a new headworks facility, and upgrading of the existing blower and pumping systems.

This alternative includes a land discharge site for disposal of treated effluent. A buried exfiltration gallery of less than 30 meters x 30 meters (100 feet x 100 feet) would be located in an upland location outside the 10-year floodplain but within the 100-year floodplain of the Middle Fork of the Flathead River (Figure 6). The exfiltration gallery consists of a buried concrete vault with multiple outlet ports that discharge treated effluent to the ground water. Treated effluent from the WWTP would be piped to the exfiltration gallery site, which would be located about 100 feet south of the Quarter Circle Bridge road. WWTP effluent would infiltrate into the surrounding gravel and soil prior to mixing with ground water. Installation of the exfiltration gallery would temporarily disturb about 0.4 hectares (1 acre) during construction. The disturbed area would be revegetated following installation.

The proposed advanced wastewater treatment facility would be designed to include sufficient operational flexibility to accommodate potential malfunctions. Examples of operational design components to ensure reliability include:

- The use of an equalization basin with 4 days of peak flow storage capacity at the front of the plant to regulate holding and plant input.
- Use of separate septage aeration pond for controlled release into the equalization pond.
- The use of two parallel sequencing batch reactor (SBR), which provides 50 percent redundancy in treatment. Thus, treatment of up to 125,000 gpd could be conducted at all times.
- All mechanical systems would have at least 50 percent redundancy.
- Use of a backup generator in the event of power failure.
- The use of additional holding ponds prior to chemical and filtration treatment allows water to be recycled through the treatment system a second time prior to discharge if necessary to meet treatment objectives.
- Complete control of the treatment process throughout the treatment cycle.
- Use of a monitoring system to ensure that effluent is meeting treatment objectives prior to discharge.

Construction of Alternative 3, a new advanced WWTP, is estimated at $3.75 million (Table 1). Costs for this facility include a new treatment building and associated controls, plumbing, batch reactors, and UV disinfection system. Annual operation costs are about $223,000 per year and includes cost for two full-time operators. Construction of this alternative would take about 2 years beginning in 2001.

Figure 6. Alternative 3 — Advanced wastewater treatment, land discharge.

Insert Figure 6.

Back of Figure 6.

2.5 Alternative 4 — No Action

The no action alternative would continue operation of the existing sewage treatment lagoon and spray field. The existing plant is no longer treating to original design criteria. Without rehabilitating the facilities, Biological oxygen demand (BOD) and suspended sediment concentrations would continue to increase. Periodic maintenance of these facilities would occur as necessary for operation. There would be no change in land use or additional land disturbance. Occasional sewage spills from the lagoon may occur during wet springs when storage capacity is exceeded and the spray field cannot be operated. To reduce the potential for spills, it may be necessary to restrict Park or concession operations in the winter and early spring.

Equipment would be repaired and replaced as necessary to continue operation of the existing wastewater treatment plant. The cost for rehabilitating the existing facility is not known. Annual operating costs likely would increase above current spending levels of $26,000 per year with additional maintenance requirements. Staffing for the existing WWTP currently is one ½-time operator.

A summary of effects from all of the alternatives is shown in Table 2.

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Table 2. Comparison of effects by alternative.

Resource	Alternative 1A Lagoon Treatment, Sprinkler Discharge, Additional Spray Field	Alternative 1B Lagoon Treatment, Sprinkler Discharge, Additional Storage	Alternative 2 Advanced WWTP, Rapid Infiltration Basin Discharge	Alternative 3 Preferred Alternative Advanced WWTP, Land Discharge	Alternative 4 No Action
SOILS	Long-term loss of soil productivity from construction of new lagoon. Temporary soil disturbance for construction of spray field.	Long-term loss of soil productivity from construction of new lagoons.	Long-term loss of soil productivity at the infiltration basins.	Minor soil impact in area of existing disturbance for construction of WWTP, and temporary disturbance for construction of discharge outlet.	No effect.
WATER RESOURCES AND FLOODPLAINS	No new effect to floodplains, existing spray field remains in floodplain. New spray field allows discharge in the spring. Improved treated effluent water quality. No adverse effect to water resources. Total Maximum Daily Load (TMDL) criteria would be met for Flathead Lake.	No new effect to floodplains, existing spray field remains in floodplain. Improved treated effluent water quality. No adverse effect to water resources. TMDL criteria would be met for Flathead Lake.	Existing floodplain spray field no longer used. Nitrogen concentration in treated effluent = < 7.5 mg/l. No adverse effect to water resources. TMDL criteria would be met for Flathead Lake.	Existing floodplain spray field no longer used. Nitrogen concentration in treated effluent = < 7.0 mg/l. Phosphorous concentrations = < 0.7 mg/l. No adverse effect to water resources. TMDL criteria would be met for Flathead Lake.	Existing spray field remains in floodplain. Water quality of treated effluent would deteriorate with aging WWTP. Under current operation, no adverse effect to water resources and TMDL criteria would be met for Flathead Lake. Occasional raw sewage spills possible.
WILD AND SCENIC RIVERS	No adverse effect to Wild and Scenic River designation of Middle Fork of the Flathead River.	No adverse effect to Wild and Scenic River designation of Middle Fork of the Flathead River.	No adverse effect to Wild and Scenic River designation of Middle Fork of the Flathead River.	No adverse effect to Wild and Scenic River designation of Middle Fork of the Flathead River.	No adverse effect to Wild and Scenic River designation of Middle Fork of the Flathead River.
VEGETATION	Long-term loss of 6.5 hectares (16 acres) of forested plant community at lagoon site. Change in natural forest composition at new spray field from forest to meadow.	Long-term loss of 3.6 hectares (9 acres) of forested plant community at lagoon sites.	Long-term loss of 3.6 hectares (9 acres) of forested plant community at infiltration basins.	Minimal vegetation disturbance with new WWTP. Temporary disturbance of 0.4 hectares (1 acre) of grassland for installation of discharge outlet.	No effect.

Resource	Alternative 1A Lagoon Treatment, Sprinkler Discharge, Additional Spray Field	Alternative 1B Lagoon Treatment, Sprinkler Discharge, Additional Storage	Alternative 2 Advanced WWTP, Rapid Infiltration Basin Discharge	Alternative 3 Preferred Alternative Advanced WWTP, Land Discharge	Alternative 4 No Action
WILDLIFE AND AQUATIC RESOURCES	Long-term loss and fragmentation of habitat at lagoon site. Change from forest to meadow in spray field would affect the types of wildlife using this area. Minor disruptions in animal movement. No effect to fisheries. Potential continued effect to subaquatic invertebrates below existing and new spray field.	Long-term loss and fragmentation of habitat at lagoon sites. Minor disruptions in animal movement. No effect to fisheries. Potential continued effect to subaquatic invertebrates below existing spray field.	Long-term loss and fragmentation of habitat at infiltration basins. Minor disruptions in animal movement. No effect to fisheries. Potential continued effect to subaquatic invertebrates below discharge basins. Potential recovery of subaquatic invertebrates below existing spray field.	Minimal effect on wildlife due to limited ground disturbance. No effect on fisheries. Potential improvement to subaquatic invertebrate habitat due to high quality of treated effluent.	No adverse effect to wildlife or fisheries from continued operation of the existing facility. Subaquatic invertebrates may continue to be affected by spray field effluent discharges. A failure in the existing sewage lagoon could adversely impact aquatic resources.
THREATENED, ENDANGERED, AND STATE SENSITIVE SPECIES	No adverse effects to threatened or endangered species. Potential loss of few individual velvetleaf blueberry plants, a state threatened species. Unlikely to adversely affect the Park population or lead to a federal listing.	No adverse effects to threatened or endangered species. Potential loss of few individual velvetleaf blueberry plants, a state threatened species. Unlikely to adversely affect the Park population or lead to a federal listing.	No adverse effects to threatened or endangered species. No effect on velvetleaf blueberry.	No adverse effects to threatened or endangered species. No effect on velvetleaf blueberry.	No adverse effects to threatened or endangered species. No effect on velvetleaf blueberry.
VISUAL RESOURCES	Change in visual landscape with new lagoon and spray field, but minimal effect on scenic value of Park due to site location.	Change in visual landscape with new lagoons, but minimal effect on scenic value of Park due to site location.	Change in visual landscape with new infiltration basins, but minimal effect on scenic value of Park due to site location.	Minimal effect to landscape and scenic value of the Park with construction of new building and discharge outlet.	No change in the existing visual quality of the landscape.
NOISE AND ODOR	Minor noise and odor similar to existing conditions. Unlikely to be perceptible to Park visitors under normal operations. Temporary noise increase during construction.	Minor noise and odor similar to existing conditions. Unlikely to be perceptible to Park visitors under normal operations. Temporary noise increase during construction.	Minor noise and odor similar to existing conditions. New building would contain mechanical noise. Unlikely to be perceptible to Park visitors under normal operations. Temporary noise increase during construction.	Minor noise and odor similar to existing conditions. New building would contain mechanical noise. Unlikely to be perceptible to Park visitors under normal operations. Temporary noise increase during construction.	No change in existing noise and odor. Generally not perceptible to Park visitors under normal operations.

Resource	Alternative 1A Lagoon Treatment, Sprinkler Discharge, Additional Spray Field	Alternative 1B Lagoon Treatment, Sprinkler Discharge, Additional Storage	Alternative 2 Advanced WWTP, Rapid Infiltration Basin Discharge	Alternative 3 Preferred Alternative Advanced WWTP, Land Discharge	Alternative 4 No Action
VISITOR USE AND EXPERIENCE	Minimal direct effect due to location of WWTP. A horse/foot trail would need to be relocated. Visitors would benefit from a year-round operational WWTP.	Minimal direct effect due to location of WWTP. A horse/foot trail would need to be relocated. Visitors would benefit from a year-round operational WWTP.	Minimal direct effect due to location of WWTP. A horse/foot trail would need to be relocated. Visitors would benefit from a year-round operational WWTP.	Minimal direct effect due to location of WWTP. Temporary restricted access to Quarter Circle Bridge area during construction of discharge outlet possible. Visitors would benefit from a year-round operational WWTP.	Minimal direct effect due to location of WWTP. Potential indirect impact to visitor use if WWTP is unable to meet demand.
LAND USE	Change in land use on 6.5 hectares (16 acres) from undeveloped forest to sewage lagoon and grassland spray field. Spray field would remain a livestock pasture.	Change in land use from 3.6 hectares (9 acres) of undeveloped forest to sewage lagoons. Spray field would remain a livestock pasture.	Change in land use from 3.6 hectares (9 acres) of undeveloped forest to infiltration basins. Abandoned spray field would remain a livestock pasture.	Minimal change in land use from disturbed parking area to WWTP building. Abandoned spray field would remain a livestock pasture.	No effect. Spray field would remain a livestock pasture.
LOCAL AND REGIONAL ECONOMY	Improved facility would allow for continued operation of existing Park facilities and anticipated growth. Short-term construction related spending would be minor relative to local and regional economies.	Improved facility would allow for continued operation of existing Park facilities and anticipated growth. Short-term construction related spending would be minor relative to local and regional economies.	Improved facility would allow for continued operation of existing Park facilities and anticipated growth. Short-term construction related spending would be minor relative to local and regional economies.	Improved facility would allow for continued operation of existing Park facilities and anticipated growth. Short-term construction related spending would be minor relative to local and regional economies.	Existing WWTP may not be able to meet future wastewater demands. Limited storage capacity could affect winter and early spring Park and concession operations.

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2.6 Alternatives Eliminated from Study

Wastewater Treatment System Alternatives

Several additional alternatives were considered during the planning process for this project. These alternatives would meet the purpose and need of the project, but were eliminated from further consideration due to potential adverse environmental effects or other constraints. The previously discussed alternatives were developed from modifications of these alternatives.

Lagoon Treatment, Sprinkler Discharge, Additional Spray Field. This alternative is similar in function to Alternative 1A and would result in the creation of a new 6-hectare (15-acre) spray field located south of the existing sewage lagoon. A new 4.3-mgd aerated lagoon would be constructed east of the existing lagoon at the same location as Alternative 1A. Plant surveys of the project area discovered velvetleaf blueberry, a state threatened plant species, in the vicinity of the proposed spray field location. This alternative was eliminated because of impacts to the state threatened plant and the large affected area.

Advanced Wastewater Treatment Plant, Rapid Infiltration Basin Discharge. This alternative is similar to Alternative 2 and would include construction of three rapid infiltration basins on the south and east sides of the existing wastewater sewage lagoon. This alternative was eliminated from further consideration due to the presence of the state threatened velvetleaf blueberry south of the project area.

Replacement Spray Field out of the Floodplain. This alternative considered replacing the existing spray field with a new site located outside of the floodplain. A new spray field would be 22 to 81 hectares (55 to 200 acres) in size depending on vegetation cover. Because there are no existing large open meadows in the vicinity of the WWTP, about 22 hectares (55 acres) of forest would need to be cleared to provide sufficient capacity for a new spray field. If a forest spray field is used, about 81 hectares (200 acres) of irrigation pipe would need to be installed. This alternative was eliminated due to the large area of disturbance required and the presence of the state threatened velvetleaf blueberry plant in the area.

Golf Course Spray Field. This option considered potential use of the West Glacier Golf Course located outside of the Park, but within the 100-year floodplain of the Middle Fork of the Flathead River. This alternative was eliminated because regulations do not allow placement of new sewage treatment spray fields within a 100-year floodplain.

Wastewater Treatment Outside the Park. Another option considered was Park Service participation in a regional advanced wastewater

treatment system located outside of the Park. Discussions with Flathead County Commissioners and the Flathead County Health Department indicated that there are no current or reasonably foreseeable plans to construct a regional wastewater facility. The Park may participate in a future regional WWTP, but current needs require a more immediate solution.

Discharge Outlet Alternatives

Several options for discharge of treated effluent were considered for the Preferred Alternative. The design options considered included use of a percolation stream/pond, a constructed wetland, the existing spray field, a surface water discharge to the Middle Fork of the Flathead River, and the proposed exfiltration galley previously discussed for the Preferred Alternative. Because of the high quality of the treated effluent, the type of discharge outlet is not a critical factor necessary to achieve treatment objectives. Selection of a discharge alternative was based primarily on minimizing disturbance to natural habitat in the Park, visual quality considerations, and operational flexibility. The discharge options considered but eliminated are discussed below.

Percolation Channel or Pond. Effluent from the WWTP would be piped to the existing spray field where a meandering channel or percolation bed would be constructed. This stream or pond would be less than 4 hectares (10 acres) and constructed to prevent effluent flow directly to McDonald Creek. Effluent would percolate into the gravel and soil of the floodplain. The cost for this option is $25,000 for construction of a channel or pond. This discharge option was eliminated because of the desire to remove artificial intrusions and disturbance from the existing floodplain spray field.

Constructed Wetlands. Effluent discharge from the WWTP would be piped south of the intersection of the WWTP access road and the Quarter Circle Bridge road. A wetland of less than 0.8 hectares (2 acres) would be constructed in the floodplain area of the Middle Fork of the Flathead River, south and parallel to the Quarter Circle Bridge road. Depending on ground saturation, WWTP effluent would either infiltrate into the ground or continue to flow overland until it reached the river bank, where it would flow into the Middle Fork. This discharge option was eliminated because it would not provide any significant polishing improvement in effluent quality. The proposed WWTP would generate wastewater effluent to levels below non-degradation standards. This option also was rejected because the wide variation in WWTP discharge would make it difficult to size and efficiently operate a wetland system. A constructed wetland would only be functional during a relatively short growing season, whereas the new WWTP would operate year-round. Additional operation and

maintenance costs would be needed to support a constructed wetland. In addition, construction of a wetland would require greater disturbance and a change in the natural habitat when compared to the exfiltration gallery.

Spray Irrigation. A new pumping system would deliver effluent under pressure from the WWTP to the existing spray field in the floodplain. This option also would require that the spray field be refurbished to replace the existing spray heads, control system for the spray field, and modifications to the system to allow the spray field to operate year-round. Refurbishing the spray field would cost an additional $350,000. This discharge option was eliminated because of the high rehabilitation cost, operational limitations, maintenance requirements, and the desire to remove artificial irrigation from the floodplain.

Surface Water Discharge. A pipeline would be used to convey treated effluent from the WWTP directly to the Middle Fork of the Flathead River. This option would meet MDEQ non-degradation water quality requirements. The approximate 1,070-meter (3,500-foot) buried pipeline would follow existing roads for most of the route to the discharge point south of the Quarter Circle Bridge road. The cost for this discharge option was included in the total cost for the Preferred Alternative. This discharge option was eliminated to avoid a direct discharge into the river and minimize adverse visual effects.

2.7 Alternative Selection Process

The process of evaluating alternatives included a value analysis workshop with the interdisciplinary team. This workshop was conducted by Rothberg, Tamburini and Winsor (RTW 1999). Options identified during the value analysis workshop included four action alternatives using two types of treatment—lagoon treatment or advanced wastewater treatment. Lagoon treatments involve use of aerated lagoons and spray fields to achieve secondary levels of wastewater treatment. Alternatives 1A and 1B are lagoon treatments. Potential environmental concerns with the location of the existing spray field in the lower McDonald Creek and Middle Fork of the Flathead River floodplains and the presence of a state sensitive plant species in the forested areas surrounding the existing lagoon prompted the addition of advanced wastewater treatment systems to the list of potential alternatives. Alternative 2 is an advanced wastewater treatment facility that would discharge treated effluent through infiltration basins and would not require the use of the existing spray field. This alternative would require construction of infiltration basins near the existing lagoon. Alternative 3 is an advanced wastewater treatment facility that would include treatment to reduce nitrogen and phosphorus levels and a land discharge location. This alternative requires minimal new disturbance with construction of a new treatment building and a discharge outlet.

The value analysis included a non-monetary evaluation of the alternatives. A list of non-monetary criteria to evaluate the relative effects of each alternative was identified. Natural resource criteria considered included: threatened, endangered and sensitive species, wildlife, vegetation, water quality, aquatic invertebrates, floodplain, Wild and Scenic River status, soils, noise, and odor. Other operational considerations included: simplicity and reliability of plant operation, operational flexibility, ability to operate seasonally, and ability for future expansion. Each of these criteria was assigned a weighting factor by the interdisciplinary team based on the perceived concern or value for each of the criteria. Alternatives were then given a relative ranking for each of the criteria based on the anticipated effects. Composite non-monetary scores were calculated for each alternative (Table 3). The value analysis provided a preliminary method to distinguish the pros and cons of alternative wastewater systems. Additional more detailed analysis of each alternative followed this initial evaluation.

Results of the non-monetary evaluation gave the highest rating to Alternative 3, the advanced WWTP. This alternative has the highest level of water treatment and the least impact on natural resources. Alternative 1B ranked second followed by Alternative 2 and Alternative 1A.

An additional component of the value analysis was consideration of the capital construction costs and annual operating costs, for each of the action alternatives. Alternative 3 would have the highest capital and operating cost and Alternative 1B and 1A would have the lowest. A ratio of the non-monetary factors to cost was used to develop an overall cost/benefit of the different alternatives (Table 3). Alternative 1B rated best, followed by Alternatives 1A, 3, and 2.

Table 3. Value analysis summary.

Component	Alternatives			
	1A	1B	2	3
Total capital cost ($)	2,148,900	2,063,100	2,999,900	3,702,600
Total annual operating cost[†] ($)	161,700	155,400	207,900	223,000
Present worth of annual cost ($)	2,015,100	1,936,600	2,590,900	2,779,100
Total present worth cost ($)	4,164,000	3,999,700	5,590,800	6,481,700
Total present worth cost (millions of dollars)	4.2	4.0	5.6	6.5
Non-monetary score	154	166	165	232
Non-monetary/Cost Ratio[‡]	37	42	30	36

[†]Annual costs are based on the midpoint operating costs applied over 20 years.

[‡]Non-monetary score divided by total present worth cost in millions of dollars.

Alternative 3 was selected as the preferred alternative for several reasons. This alternative would have substantially fewer adverse effects on the environment than other alternatives. Rehabilitation of the existing facility and raising the level of treatment ability would require minimal new surface disturbance and would eliminate the current use of the McDonald Creek/Middle Fork of the Flathead River floodplain as an effluent spray field. Alternative 3 would produce the highest quality of treated effluent and would minimize effects to downstream water quality and aquatic resources. This facility would improve seasonal operation and could be expanded if needed.

2.8 Mitigation Measures Common to All Alternatives

A number of conservation measures would be incorporated into the design and construction of the selected facility to minimize potential environmental impacts. The following mitigation measures would be applicable to all of the action alternatives.

- Restricting construction activity to the period between 7:00 a.m. and 8:00 p.m. to minimize potential disturbance to wildlife.
- Limiting outdoor construction to the period between June 1 and December 1 to minimize effects to wildlife. Indoor activities such as painting, wiring, and plumbing could occur year-round.
- Placing barriers around velvetleaf blueberry plants in the vicinity of the project site to minimize the risk of accidental injury.
- Conserving any topsoil disturbed.
- Developing a hazardous spill plan prior to construction
- Not operating or storing equipment or vehicles leaking oil, gas or anti-freeze.

- Prohibiting draining of oil, hydraulic fluids, anti-freeze, or other chemicals in the Park.
- Not allowing vehicles or equipment outside the work limits or on topsoil areas.
- Prohibiting the use of explosive materials.
- Prohibiting feeding or disturbing wildlife.
- Maintaining bear-proof refuse containers.

3.0 Affected Environment

3.1 Natural Resources

Soils

The floodplain soils in the project area are composed of gravel, cobbles and boulders derived from glacial outwash and alluvial stream deposits. Parent materials include quartzite, argillite and some limestone and granitic rock fragments in stratified layers (Land and Water Consulting 1995). These soils are extremely variable but, generally have sandy to loamy sand surface textures with very high concentrations of coarse fragments throughout the soil profile. Clay soils are also present within the floodplain due to recent alluvial deposits (Glacier National Park 1973). Permeability is generally high and nutrient-holding capacity is low due to the coarse texture of the soils.

Soils in the upper terrace outside of the 100-year floodplain are classified as silty over alluvial soils (Land and Water Consulting 1995). These soils are derived from cobbly alluvium and glacial outwash. Volcanic ash may be present in some locations. Parent material is similar to the floodplain soils. The surface texture is silty and subsoils are silty loams or silty clay loams. Stratified layers of glacial till and gravel deposits are found at depths to over 7.6 meters (25 feet) (GMT Consultants 1999). Soil testing indicates moderate to low permeability with soil composition conducive to further nutrient removal by soil bacteria.

Water Resources and Floodplains

The project area is located near the confluence of McDonald Creek and the Middle Fork of the Flathead River (Figure 2). Lake McDonald is located about 3.3 kilometers (2 miles) upstream from the confluence. The McDonald Creek drainage originates near the Continental Divide and is a tributary to the Middle Fork of the Flathead River. The existing spray field is located within the 100-year floodplain of McDonald Creek and the

Middle Fork of the Flathead River. Proposed and alternative project facilities would be located outside of the 100-year floodplain, with the exception of several of the discharge outlet options.

Stream flow varies seasonally, generally peaks during the early summer, and is lowest during the winter (USGS 2000). The 50-year peak flow estimate for McDonald Creek is 334 cubic meters per second and the 100-year peak flow estimate is 469 cubic meters per second. The 50-year peak flow estimate for the Middle Fork of the Flathead River is 1,765 cubic meters per second.

Existing water quality in McDonald Creek and the Middle Fork of the Flathead River near the proposed project area is good due to the lack of development and disturbance in the area. The water use classification for the Middle Fork of the Flathead River and McDonald Creek is A-1 (Montana Water Quality Act ARM 17.30.608). The A-1 classification denotes high quality water suitable for drinking and culinary food processing following conventional treatment, bathing, swimming, and recreation, growth and propagation of salmonid fishes and aquatic life, waterfowl, furbearers, and agricultural and industrial water supplies (Montana Water Quality Act ARM 17.30.622). Portions of McDonald Creek and the Middle Fork within Glacier National Park also are designated as "outstanding resource waters" due to their environmental, economic, ecological value (Montana Water Quality Act 75-5-315, 316, MCA). Nutrient concentrations for McDonald Creek and the Middle Fork are low (Hauer 1988). Previous studies in McDonald Creek and the Middle Fork of the Flathead River below the existing spray field found no indication of septic leachates entering the shoreline of these drainages (Hauer 1988). Monitoring data from ground water wells below the spray field indicate low concentrations of nitrogen and phosphorous (Glacier National Park 1992).

The Flathead Basin Commission is in the process of determining Total Maximum Daily Load (TMDL) targets to protect water quality in Flathead Lake. MDEQ has identified Flathead Lake as a waterbody that is not fully meeting state water quality standards. Flathead Lake is located downstream from the project area and the Middle Fork of the Flathead River is a tributary to the lake. Interim target levels for discharges from wastewater treatment plants in the Flathead Lake watershed are 1.0 mg/l of phosphorus (Flathead Lakes 1997).

Wild and Scenic Rivers

In 1976, Congress designated the three forks of the Flathead River as part of the national scenic river system. Under the Wild and Scenic Rivers Act, The Middle Fork of the Flathead River was designated "recreation" for the entire length bordering Glacier National Park. The Middle Fork provides boating, fishing, and scenic recreation opportunities. The U.S. Forest Service is the primary management agency for the Flathead Wild and Scenic River, and the National Park Service has secondary responsibility.

Vegetation

Vegetation composition in the floodplain portion of the project area is the result of current and historical use of the meadow as pasture for Park mules and horses. Summer grazing of this meadow and irrigation from the spray field has altered the native vegetation present at this site. The floodplain grassland is characterized by introduced grass species such as timothy, brome grass, blue grasses and wheatgrass (Morrison-Maierle, Inc. 1973). Riparian vegetation adjacent to lower McDonald Creek and the Middle Fork of the Flathead River includes forest stands of black cottonwood, paper birch, lodgepole pine, and spruce. Willow, alders, dogwood, chokecherry and serviceberry are common shrubs in this area. A forb/grass understory consists of native and exotic grass and forb species including goldenrod, aster, arnica, spotted knapweed and common dandelion.

Vegetation in the upper terrace portion of the project area is currently dominated by lodgepole pine forest with a snowberry and huckleberry understory. Prior to a wildfire in 1929, this site supported a western red cedar/western hemlock forest. Because of the abundant precipitation this area receives, the habitat type and potential for this area is Hemlock-Queens cup bead lily. Currently the site supports a diversity of native and exotic plant species. Tree species found in association with the lodgepole pine overstory include Engelmann spruce, aspen, black cottonwood, western larch, western red cedar and western hemlock. Common shrubs include snowberry, tall huckleberry, grouseberry and thimbleberry. Understory grass and forbs include pinegrass, western ryegrass, rough-leaf ricegrass, yarrow, rosy pussy-toes, harebell, strawberry, and Canada violet. Ferns include lady's fern, bracken fern and common horsetail. Round-leaved rein-orchid, a unique plant with a small distribution in Montana, is found in the northern portion of the project area. A number of exotic grasses and forbs not native to the site are present, including bluegrass, timothy, hop clover, bull thistle, and dandelion. Appendix A includes a partial list of plant species found in the project area.

Wildlife and Aquatic Resources

Waterton-Glacier Park provides habitat for a diversity of wildlife including approximately 261 bird species, 63 mammals, and 172 native resident aquatic species (NPS 1998a). Wildlife are distributed throughout the Park according to specific habitat preferences and seasonal use patterns. The project area is used by over 30 species of mammals and 125 bird species. River otters, beaver, muskrats, and mink use lower McDonald Creek and the oxbow ponds and channels upstream from the wastewater treatment facility. A variety of water birds, such as great-blue herons, trumpeter swans, tundra swans, Canada geese, Harlequin ducks, wood ducks, hooded mergansers, bufflehead, common goldeneye, Barrows goldeneye, killdeer and spotted sandpiper, use the river and riparian habitat.

Forests and meadows in the project area and vicinity support a large number of Columbian ground squirrels, which in turn support a variety of predators, including coyotes, great-horned owls, northern goshawks, and other raptors. Sharp-shinned hawks and Cooper's hawks have been observed in the area during migration. Other raptors likely present in the vicinity include osprey, red-tailed hawk, northern pygmy owl, northern saw-whet owl, and barred owl.

Corvids, woodpeckers and an abundance of songbirds nest and forage in the varied habitat types surrounding the project area. Habitats with highest diversity include the riparian zone of cottonwoods, willows, hawthorn and other deciduous shrubs. Common breeding birds in the area include: rufous hummingbird, belted kingfisher, northern flicker, hairy woodpecker, willow flycatcher, tree swallow, common crow, black-capped chickadee, American dipper, American robin, ruby-crowned kinglet, yellow warbler, common yellowthroat, pine siskin, red-winged blackbird, dark-eyed junco, western tanager, black-headed grosbeak and fox sparrow.

Forested areas in and surrounding the project area provide an important elk calving area during late May and June. Calving sites are on the oxbow islands, other riparian areas and forested sites near the sewage lagoon. There is elk movement through the area during the spring (April-June) and fall (September-October). Elk feed in the wastewater treatment plant spray field and other meadows. Mule deer and white-tailed deer also move through the area during the spring and fall. Deer may give birth to fawns in the area and some may remain year-round. Coyotes probably prey on the elk calves and deer fawns. Coyotes have denned in the vicinity of the project area in the past, but there are no known currently active den sites.

Black bears may forage and travel through the area. Prey species, especially deer, attract mountain lions that may be present throughout the year. Tracks of fisher and wolverines have been observed in the area and

other mammals such as marten, short-tailed weasel, long-tailed weasel, and an occasional least weasel or striped skunk also may be present.

McDonald Creek and the Middle Fork of the Flathead River support four native salmonid species—bull trout, westslope cutthroat trout, mountain whitefish and pygmy whitefish. Introduced fish include rainbow trout, brook trout, lake trout and Yellowstone cutthroat trout.

The substrate of Middle Fork of the Flathead River and lower McDonald Creek are composed of cobbles and boulder derived from glacial outwash and alluvial processes. Research by the Flathead Lake Biological Station indicates that these alluvial sediments are saturated to bedrock by river water (Stanford 1999). The aquifer associated with the alluvium in the Middle Fork of the Flathead River supports a community of subaquatic invertebrates referred to as the hyporheic community (Stanford and Ward 1988). This biotic community contains many different species of invertebrates including large (3-cm) stoneflies. Observations in Flathead River alluvial aquifers indicate that these species are numerous and similar species have been found at other locations in Montana and Washington (Stanford 1999). Insufficient information is available to determine the distribution, species diversity, and relative rarity of the hyporheic community. Studies on the Flathead River indicate the hyporheic community is very sensitive to sewage effluent (Noble and Stanford 1986). The existing spray field contains suitable habitat for supporting a hyporheic community unless it has been affected by existing spray field operations (Stanford 1999). No information is available on the presence or condition of the hyporheic community in the project area.

Threatened, Endangered and State Sensitive Species

Threatened, endangered, and state sensitive species are found throughout the Park. These resources are discussed below.

Threatened and Endangered Species

Glacier National Park provides habitat for five threatened and endangered species—bald eagle, gray wolf, grizzly bear, bull trout, and lynx (Table 4). Several of these species have wide ranges and may be found throughout the Park. Lynx was listed as a threatened species in March 2000. In March 2000, the U.S. Fish and Wildlife Service determined that listing the westslope cutthroat trout is not warranted at this time.

Table 4. Federally listed wildlife and aquatic species.

Common Name	Scientific Name	Federal Status
Bald eagle	*Haliaeetus leucocephalus*	Threatened
Gray wolf	*Canis lupus*	Endangered
Grizzly bear	*Ursus arctos horribilis*	Threatened
Bull trout	*Salvelinus confluentus*	Threatened
Canada lynx	*Lynx canadensis*	Threatened

Bald eagle. Bald eagles are both year-round residents and seasonal visitors to the Park. Prior to the collapse of the kokanee salmon spawning runs in the late 1980s and early 1990s, as many as 600 bald eagles concentrated along lower McDonald Creek from mid September to mid-December (Spencer et al. 1991). Although bald eagle activity has declined in lower McDonald Creek and the Middle Fork of the Flathead River, the area is still used for foraging by resident bald eagles nesting at Lake McDonald and non-nesting migrant and wintering eagles. Resident bald eagles from the Lake McDonald nesting territory use the area most frequently during the winter and spring and less frequently in the summer. Bald eagle use of the area increases during migration (primarily March-April and October-November). Resident and migrant eagles continue to forage along lower McDonald Creek during the winter. In recent years, bald eagles have made sporadic and relatively infrequent use of the area without periods of concentrated activity.

The U.S. Fish and Wildlife Service is proposing to delist the bald eagle due to recovery of the population. A final decision is expected in July 2000. Even if the bald eagle is removed from the threatened and endangered species list, it would still be protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act as well as the NPS Organic Act.

Gray wolf. Gray wolves are wide-ranging and their distribution is tied primarily to that of their principal prey (deer, elk, and moose). Key components of wolf habitat are: 1) a sufficient, year-round prey base of ungulates and alternate prey; 2) suitable and somewhat secluded denning and rendezvous sites; and 3) sufficient space with minimal exposure to humans (U.S. Fish and Wildlife Service 1987).

Principal wolf habitat is located in the northwest corner of the Park in the North Fork area. After a long absence, wolves from Canada began recolonizing the Park in the 1980s (Rockwell 1995). Wolves have been reported from all of the major drainages in the Park, but their activity appears to be primarily in the northern portions of the Park. Wolves that

occasionally move through the project area are known mostly from records in the winter. White-tailed deer, mule deer, elk calves in the spring, and other small prey may attract wolves to the area. There are no known den sites or pack activity near the project area.

Grizzly bear. Grizzly bears have home ranges of 130 to 1,300 square kilometers and use a mixture of forests, moist meadows, grasslands, and riparian habitats (U.S. Fish and Wildlife Service 1995). The grizzly bear population in the Park is not known, but bear habitat is found throughout the Park. Seasonal movement and habitat use are tied to the availability of different food sources. In the spring, bears feed on dead ungulates and herbaceous vegetation at lower elevations. During the summer, some bears move to higher elevations in search of berries, glacier lilies, roots, and in some cases army cutworm moths (NPS 1998a). Avalanche chutes provide an important source of herbaceous forage for grizzly bears in the summer and fall (Rockwell 1995). Fish may have been an important component of the diets of some grizzly bears when kokanee salmon were present along lower McDonald Creek, but now probably play a minor role. Winter hibernation dens are away from human disturbance, typically on steep slopes at high elevations.

The potential for grizzly bear/human interaction is an important concern for Park management. Habituation of bears to human presence can result in increased risk to visitors and relocation or removal of bears. Management actions focus on minimizing the potential for bear/human encounters.

The lands surrounding the project area provide foraging habitat for grizzly bears primarily during the spring and summer and to a lesser extent during the fall. There are no known den sites in the area. Grizzlies are probably attracted to the area in the spring and early summer by the succulent herbaceous vegetation in the wastewater spray field and floodplain riparian areas along lower McDonald Creek. Grizzlies also may be attracted to elk calves in late May and June. Huckleberries attract bears to the area in late July and August. Operation of the existing wastewater facility and stables in the project area may discourage grizzly bear activity during the daylight hours when people are present.

Bull trout. Bull trout seasonally move throughout river basins, with spawning and juvenile rearing limited to the coldest streams (USFWS 1998). Bull trout have multiple life histories consisting of two distinct forms: resident and migratory. Resident populations usually spend their entire lives in small headwater streams, whereas migratory bull trout are born and reared in small tributary streams before migrating to lakes and rivers. Spawning occurs from August through November with hatching in early winter or spring. Substrate composition is an important factor in

spawning site selection, and fine sediments can affect incubation and survival.

Bull trout are found in the North and Middle Forks of Flathead River as well as several tributaries (NPS 1998b). Bull trout are known to move upriver from Flathead Lake during periods of high flow in the spring. Most of the migration occurs during the night or when light levels are low to avoid detection and predation. Bull trout are known to use lower McDonald Creek as a travel corridor between the Middle Fork of the Flathead River and Lake McDonald although there is no known spawning in lower McDonald Creek or the Middle Fork in the vicinity of the project area.

Canada Lynx. On March 24, 2000, the U.S. Fish and Wildlife Service under the Endangered Species Act, listed Canada lynx as a threatened species. Lynx habitat generally is described as climax boreal forest with a dense undercover of thickets and windfalls (DeStefano 1987). Advanced successional stages of forests and dense conifer stands often are preferred habitats of lynx for denning and foraging respectively. Large amounts of woody debris and minimal human disturbance are important features of denning sites (Brittell 1989). Lynx generally forage in young conifer forests, especially where their primary prey—snowshoe hare—is abundant. Travel corridors are thought to be an important factor in lynx habitat because of their large home ranges, generally 15 to 21 square kilometers (9 to 13 square miles) (Butts 1992). Travel cover includes contiguous vegetation cover over 2 meters (6 feet) tall (Brittell 1989). Fragmentation of habitat and the limited availability of snowshoe hare are believed to contribute to the rarity of lynx (Ruggiero et al. 2000). Lynx are wide ranging species with unknown population numbers in the Park.

Lynx in the Park are known from observations and tracks in coniferous forest both east and west of the Continental Divide although most records are from the east side. Sightings and track reports are rare in the vicinity of the project area, but there have been no intensive surveys to document lynx use in this area. Lynx tracks have been observed in the vicinity of the project area during the winter. Lodgepole forests in the project area and riparian habitat along lower McDonald Creek provides habitat for snowshoe hare, the lynx's principal prey.

Plants. There are no known federally listed or threatened plant species in Glacier National Park (NPS 1998a). Habitat for the federally threatened water howellia (*Howellia aquatilus*), a wetland-dependent species, may be present in the Park, but there are no recorded observations or potential habitat in the project area. There are three plant "species at risk" in the Park that were formerly listed as Category 2 species by the U.S. Fish and

Wildlife Service. None of these species are known from locations near proposed project activities.

State Sensitive Species

The Montana Natural Heritage Program has identified 32 state sensitive wildlife species with potential occurrence in the Park (NPS 1998a). Several of these species may be present or use habitat in the vicinity of the project area. According to the Montana Natural Heritage Program, there are 45 state sensitive plant species known to be present in the Park (NPS 1998a). Many of these species are found in wetland or alpine habitat not present in the project area. These species are discussed below.

Marten (*Martes americana*), fisher (*Martes pennanti*), and wolverine (*Gulo gulo*). Martens are fairly common residents in coniferous forests, with breeding documented in the Park. Fishers are rare residents in conifer forests and riparian areas. Wolverines are rare residents of conifer and alpine forests, with documented breeding in the Park. Each of these species has been observed in the vicinity of the project area and may use habitat near the project area.

Trumpeter swan (*Cygnus buccinator*). Rare spring and fall migrants to the Park, trumpeter swans may use habitat along lower McDonald Creek.

Harlequin duck (*Histrionicus histrionicus*). Harlequin ducks are common migrants from spring to fall in the Park where they breed in fast moving streams. Waterton-Glacier International Peace Park provides breeding habitat for about 20 percent the harlequin ducks in Montana (NPS 1998a). Breeding habitat includes the lower McDonald Creek drainage. There is little documented use of lower McDonald Creek during the summer by harlequin ducks, but potential periods of use are from late April to mid-September, with most use declining during August and September.

Osprey (*Pandion haliaetus*). Osprey are fairly common in the spring and fall along rivers and lakes in the Park and may use habitat in the project area.

Northern goshawk (*Accipiter gentilis*). Northern goshawks are not known to nest in the project area although no intensive nesting surveys have been conducted. Goshawks from a known nesting area about 2 kilometers (1.2 miles) southeast of the project area, as well as migrant or other resident goshawks, may forage on Columbian ground squirrels in the wastewater spray field.

Cooper's hawk (*Accipiter cooperii*). Cooper's hawks are uncommon from spring to fall in forested areas. They have been observed near the project area primarily during migration.

Northern pygmy owl (*Glaucidium gnoma*). Northern pygmy owls are fairly common year-round forest residents in the Park and may use habitat near the project area.

Barred owl (*Strix varia*). Barred owls are uncommon year-round residents of conifer forest and riparian areas that may use habitat in the vicinity of the project area.

Northern saw-whet owl (*Aegolius acadicus*). Northern saw-whet owls are uncommon residents in conifer or mixed forests that may be found in the project area.

Pileated woodpecker (*Dryocopus pileatus*). Pileated woodpeckers are fairly common in the Park in mature forest areas and could be found in habitat near the project area.

Velvetleaf blueberry (*Vaccinium myrtilloides*). Velvetleaf blueberry is a state threatened species found in forested areas near the Park's existing wastewater lagoon. This is primarily a Canadian species with only four recorded observations in Montana, all within Flathead County (Montana Natural Heritage Program 1999). At least two of the known populations are within Glacier National Park. Velvetleaf blueberry is globally secure, but critically imperiled in the state (Montana Natural Heritage Program 1999). There are no other known state sensitive plant species in the vicinity of the proposed project.

Visual Resources

The project area is located in the southern corner of the Park, in an area that receives a limited number of visitors. McDonald Creek and the Middle Fork of the Flathead River are the dominant visual features in the vicinity of the project area. Surrounding forestlands and meadows provide a pleasant landscape, although there are numerous land alterations in the area. Man-made features in this area include the existing sewage lagoon, spray field and structures, a materials storage area, an explosives magazine, horse stables and corral, air quality sampling site, gravel roads and utility line corridors. The existing fenced spray field is visible to Park users along the Quarter Circle Bridge Road and has a relatively natural appearance although sprinkler heads and the electric fence are visible. A portion of the project area is viewed by visitors on the hiking and horseback trails north of the existing sewage lagoon. Preservation of the Park's scenic values is an essential component of any management activity.

Noise

The natural sounds of wind, water, and animals resonate throughout the Park. Artificial noise in the Park is generated from human activities such as traffic, motorboats, scenic air tours, and general maintenance and administrative activities. Elevated noise levels are most closely associated with visitor service zones near campgrounds, lodges, roads and developed areas. Noise levels in the vicinity of the project area are low to moderate, due to existing Park operations. Park staff, equipment and vehicles regularly access the wastewater treatment facilities and storage yard for maintenance and operations. Noise from Park visitor use is low and primarily includes traffic to Quarter Circle Bridge to access fishing, trails, and boating.

3.2 Socioeconomic Resources

Park Visitation and Use

In recent years, visitation to Glacier National Park has ranged between 1.7 and 1.8 million. The highest recorded visitation, 2,204,131, was in 1983. The overall trend is for increasing visitors.

A 1991 visitor survey found that most of the Park's visitors were families or friends who came to view the scenery and wildlife and for recreational opportunities such as hiking, fishing, and biking. Another 11 percent were just passing through on their way to another primary destination. Waterton-Glacier International Peace Park lies within a day's drive of several notable areas with natural, cultural, and recreational opportunities including Yellowstone and Grand Teton National Parks to the south, and the Banff, Jasper, Yoho, and Kootenai National Parks to the north. Most Park visitors contacted were from the U.S., with 12 percent from Canada and 4 percent from other countries. Forty percent of all visitors reported that they would spend less than 1 day in the Park, while 33 percent would stay 1 to 3 days, and 27 percent would stay 4 days or more.

Park visitor activities in the vicinity of the project area occur primarily near the Quarter Circle Bridge (Figure 2). A gravel road borders the existing spray field and provides access to the bridge. This site is used for fishing and boating, and provides access for hiking, horseback riding, cross-country skiing, and snowshoeing. Quarter Circle Bridge also is a take out point for kayakers and rafters originating from Lake McDonald. During the summer, the bridge allows access by a private concessionaire for horseback trail rides. A horse trail runs through the north end of the project area (Figure 3). It receives seasonal use by horseback riders and joggers. There are no other visitor attractions in the project area. Vehicle traffic into Park wastewater and storage facilities is restricted.

Land Use

Glacier National Park totals 4,087 square kilometers, of which 170 hectares are privately held. Private lands in the Park are undeveloped or used for residential, recreational, or commercial purposes. All of the property in the project area is owned and managed by the National Park Service. Land use in the project area includes the existing sewage lagoon, pump house and spray field, a materials storage area, a horse/foot trail and explosives magazine. Other developed areas include buried utility corridors, gravel roads and parking areas. Facilities in the vicinity include the Park's stable, the existing spray field, which is used as horse and mule pasture, and an air quality monitoring station. The remainder of the project area is natural lodgepole pine forest.

Regional Use and Economy

Tourism is an important part of the Montana economy, and has dramatically increased in the region during the last several years. The trend in tourism has been estimated by examining visits to the Park, traffic counts on U.S. Highway 2, and accommodations tax revenue. All three show steady growth from 1980 to the mid 1990s. About 20 percent of all non-resident visitor groups in the state travel through the Flathead-Glacier area, and about 50 percent visit the Park. Visitor estimates translate to about 750,000 non-resident Park visitors, assuming 7.7 million non-residents visited Montana in 1993-1994 (NPS 1998a).

The Park is a key component of the regional and state tourism economies. Tourism in Montana generates $1.2 billion annually and directly employs 32,000 workers. Tourism, the service industry, and transfer payments (money paid to employees in Montana but earned elsewhere, such as social security and pensions) are the only expanding areas of the region's economy. Montana incomes are 82 percent of the national average. Regionally, Flathead and Missoula Counties have the highest per capita incomes and Glacier County has the lowest. Historically, the wood products industry has been important in Flathead and Missoula Counties, but the industry is on the decline. Farming is also an important source of income in Lake and Glacier Counties (NPS 1998a).

The amenities that the Park offers attract business and industry to the region. The Park also offers amenities that are important to individuals deciding to relocate or retire in the area (NPS 1998a).

During the last several years, the population has grown considerably on the west side of the Continental Divide; growth has been slow on the east side. If growth continues at the current rate, it is estimated that Flathead and Missoula Counties will exceed 100,000 people by 2010. If population

growth continues in Flathead County, 11,000 new housing units will be needed and increased commercial and private traffic can be expected (NPS 1998a).

Population centers within a day's drive of the Park include Great Falls, Bozeman, Billings, Missoula, and Kalispell, Montana. Other areas are Spokane, Washington, Calgary and Edmonton, Alberta, and Boise, Idaho. Continued population and economic growth in these areas would affect visitation to the Park.

The existing wastewater treatment facility serves Apgar Village, Fish Creek, Sprague Creek and Apgar campgrounds, Lake McDonald Lodge, Park Headquarters, maintenance facilities, and residences. The wastewater system serves approximately 60 percent of the visitors to the Park. Continued operation of the Park wastewater system is important to maintaining the local and regional economy.

4.0 Environmental Consequences

4.1 Natural Resources

Soils

Alternative 1A — Lagoon Treatment, Sprinkler Discharge, Additional Spray Field

Construction of a new seasonal sewage lagoon east of the existing lagoon would affect about 1.2 hectares (3 acres) of soil resources. There would be long-term loss in soil productivity from this site and temporary disturbance from pipeline installation. A new spray field would require removal of the forest cover and grading to create a meadow for installation of a new sprinkler spray field on 5.3 hectares (13 acres). Soil disturbance on the spray field site would be a temporary disturbance and the site would be revegetated with grass and forb species. Soil productivity at the spray field would increase with the application of treated effluent. Soil chemical properties also may change with a different ground cover and the application of effluent. Soil erosion would be minimized with use of erosion and sediment control measures. Continued application of effluent to the existing and new spray field could affect the nutrient and chemical properties of the soil.

Alternative 1B — Lagoon Treatment, Sprinkler Discharge, Additional Storage

Construction of two new seasonal storage lagoons and an aerated lagoon would require excavation and disturbance of about 3.6 hectares (9 acres) soil resources. Excavated soil material likely would be used for lagoon embankments. There would be a long-term loss of soil productivity at the lagoon sites. Pipeline installation would temporarily affect soil resources during construction, but would have no long-term effect. Terrain at the lagoon locations is generally flat, so erosion from proposed project activities is likely to be minor. Planned use of erosion and sediment control best management practices, including revegetation of disturbed areas, would minimize the potential for soil loss. Continued application of effluent to the spray field could affect the nutrient and chemical properties of the soil.

Alternative 2 — Advanced Wastewater Treatment Plant, Rapid Infiltration Basin Discharge

Construction of a series of three rapid infiltration basins would result in the disturbance of about 3.6 hectares (9 acres) of soil. There would be a long-term loss of soil productivity at this site. Pipeline installation would temporarily affect soil resources during construction, but would have no long-term effect. Excavation for the basins would expose coarse textured subsurface materials with high hydraulic conductivity suitable for infiltration of treated effluent. Surface erosion would be minimal with use of erosion and sediment control measures. A 445-square meter (4,800-square foot) treatment building would be located within the existing disturbed parking area with minimal disturbance to soil resources.

Alternative 3 — Preferred Alternative —Advanced Wastewater Treatment Plant, Land Discharge

A new 560 square meter (6,000-square feet) wastewater treatment building would be located on existing disturbed parking areas with minimal impact on soil resources. Pipeline installation to the discharge point would follow existing roads. Pipeline installation would be a temporary disturbance with limited potential for soil loss and erosion with use of sediment and erosion control measures.

Construction of the exfiltration gallery would temporarily disturb less than 0.4 hectares (1 acre) of soils during construction, but there would be no long-term effect to soil resources with planned topsoil salvage and revegetation of the site following installation.

Alternative 4 — No Action

Continued operation of the existing WWTP may result in occasional spills that would result in the application of untreated sewage to soils surrounding the lagoon. Concentrations of untreated sewage could temporarily affect the chemical and nutrient status of these soils and the biological processes and productivity of these areas. To a lesser degree, the continued application of effluent to the spray field also could affect the nutrient and chemical status of the soils.

Cumulative Effects

Future actions to replace or repair damaged sewage collection lines in the Park would temporarily disturb soil resources for all alternatives. Under the no action alternative, there would be increased contributions of effluent to soils in the spray field over time due to inefficient WWTP operation and increased treatment demands.

Water Resources and Floodplains

Alternative 1A — Lagoon Treatment, Sprinkler Discharge, Additional Spray Field

The new lagoon and spray field would be located outside of the 100-year floodplain of lower McDonald Creek and the Middle Fork of the Flathead River. The existing spray field within the 100-year floodplain would remain in operation. Spray field facilities still would be subject to periodic flooding, but no effluent would be discharged when the field is inundated or saturated to minimize impacts to water quality. The existing sprinkler heads in the spray field would remain, but they would not substantially affect flood flows or the flood hazard risk.

Treated effluent would be applied to the existing spray field when conditions are appropriate at rates up to 250,000 gpd. The continued surface application of treated effluent would recharge the alluvial aquifer and contribute to streamflow in lower McDonald Creek and the Middle Fork of the Flathead River. There would be no substantial change in the net contribution of runoff to these drainages or hydrologic conditions from existing WWTP operations.

Water quality in lower McDonald Creek and the Middle Fork of the Flathead River would continue to meet state water quality standards. A discharge permit from MDEQ likely would be necessary and MDEQ would determine specific discharge limitations. Based on historical data (Hauer 1988; NPS 1992), nutrients would not affect ground water downgradient of the disposal areas. A periodic sampling program would be used to monitor ground water quality below the spray fields and ensure that state water quality standard are met. Based on historical data (NPS

1992), phosphorus levels in ground water monitoring wells would meet TMDL criteria and would not adversely affect Flathead Lake.

No effects to water quality are likely from proposed construction disturbance with planned erosion control measures.

Alternative 1B — Lagoon Treatment, Sprinkler Discharge, Additional Storage

The new lagoons would be located on the upper terrace above the 100-year floodplain of lower McDonald Creek and the Middle Fork of the Flathead River. The existing spray field within the 100-year floodplain would remain in operation. Planned rehabilitation of the spray field would result in only minor work to facilities currently present within the floodplain. Periodic flooding of the spray field would occur, but no effluent would be discharged when the field is inundated or saturated. The existing sprinkler heads in the spray field would remain, but they would not substantially affect flood flows or the flood hazard risk.

Spray field applications would be up to 250,000 gpd and would be similar to existing conditions. The continued surface application of treated effluent would recharge the alluvial aquifer and contribute to streamflow in lower McDonald Creek and the Middle Fork of the Flathead River. There would be no change in the net contribution of runoff to these drainages or hydrologic conditions from existing WWTP operations.

Improvements in the water quality of treated effluent are expected with construction of new lagoons. An additional aerated lagoon would increase operational flexibility. Planned improvements to the existing sewage lagoon would restore operation of the lagoon to design criteria and reduce biological oxygen demand (BOD) and suspended sediments in treated effluent. A discharge permit from MDEQ likely would be necessary and MDEQ would determine specific discharge limitations. Non-degradation requirements probably would not be proposed (Campbell 1999). Water quality in lower McDonald Creek and the Middle Fork of the Flathead River would meet state water quality standards. Based on historical data (Hauer 1988; NPS 1992), nutrients would not affect ground water downgradient of the disposal areas. A periodic sampling program required by the state would be used to monitor ground water quality below the spray fields to ensure that state water quality standards are met. Based on historical data (NPS 1992), phosphorus levels in ground water would meet TMDL criteria and would not adversely affect Flathead Lake. The risk of sewage pond leakage or spillage into lower McDonald Creek or the adjacent oxbow is expected to be minimal due to the durability of the lining material and periodic maintenance.

No adverse effects to water quality are likely from proposed construction disturbance with planned erosion control measures.

Alternative 2 — Advanced Wastewater Treatment Plant, Rapid Infiltration Basin Discharge

The infiltration basins would be located outside of the 100-year floodplain of lower McDonald Creek/Middle Fork of the Flathead River and use of the existing spray field in the floodplain would be discontinued. All WWTP facilities would be located outside of the floodplain so there would be no effect to floodplain characteristics or flooding. The infiltration basins would discharge up to 250,000 gpd of treated effluent into the ground water. Return flow to McDonald Creek and the Middle Fork of the Flathead River may be greater than the spray field alternatives because there would be less loss to evapotranspiration. The timing of discharge would be different than spray fields because the infiltration basins would operate year-round.

Advanced wastewater treatment would reduce nitrogen levels of the treated effluent more than spray field alternatives. Nitrogen concentrations in treated effluent would be less than 7.5 mg/l (Montana DEQ ground water discharge standard). No specific limitations for phosphorus are likely. Discharges to ground water are not expected to adversely affect water quality in lower McDonald Creek or the Middle Fork of the Flathead River because of nutrient removal, additional nutrient uptake by soil bacteria, and distance from these drainages. Based on historical ground water sampling data below the existing spray field (Hauer 1988; NPS 1992), ground water downgradient of the rapid infiltration basins is unlikely to contain elevated nutrient concentrations. State water quality standards in these drainages would be meet. Periodic state-required sampling below the infiltration basins would be used to ensure that state water quality standards are met. Based on historical data (NPS 1992), phosphorus levels in ground water would meet TMDL criteria and would not adversely affect Flathead Lake.

Alternative 3 — Preferred Alternative — Advanced Wastewater Treatment Plant, Land Discharge

A new advanced wastewater treatment system building would be located outside of the 100-year floodplain of lower McDonald Creek and the Middle Fork of the Flathead River. The treated effluent discharge site would be located outside of the 10-year floodplain but within the 100-year floodplain. The exfiltration gallery discharge would be buried; therefore, no obstructions that would affect flooding or increase the risk of flood hazard would be located above ground.

Because the treatment plant would operate year-round, effluent would be released throughout the year. Releases would be greatest (up to 250,000 gpd) during the summer months when visitor use is highest. Return flow to the river would be greater than the spray field and infiltration basin alternatives because there would be no evaporation or transpiration losses. Maximum discharges of 250,000 gpd would be less than 0.1 percent of 30-year low flows in the Middle Fork of the Flathead River.

This alternative would produce the highest quality of treated effluent of the alternatives under consideration. In addition to improved nitrogen removal described for the rapid infiltration basins, chemical treatment would reduce phosphorus levels. Effluent discharge from the new WWTP would meet restrictive MDEQ non-degradation water quality standards. This would require that discharge from the WWTP could not raise the total nitrogen concentration of the Middle Fork by more than 0.01 mg/l. In addition, WWTP discharge could not raise total phosphorus concentration of the Middle Fork by more than 0.001 mg/l. For the Middle Fork, using the 20-year dry season flow rate of 275 cfs as the minimum receiving streamflow results in an anticipated total nitrogen discharge limit of no more than 7.0 mg/l and a phosphorus discharge limit of as low as 0.7 mg/l. It also is anticipated that MDEQ would place a maximum effluent limit of 30 mg/l for total suspended solids and biological oxygen demand. Specific discharge limitations would be determined by the MDEQ when the Montana Pollution Discharge Elimination System (MPDES) is submitted for the selected alternative. Treated effluent discharges for Alternative 3 would be below TMDL target levels and would not adversely affect water quality in Flathead Lake.

No adverse effects to water quality are likely from proposed construction disturbance with planned erosion control measures.

Alternative 4 — No Action

There would be no change in facilities located in the floodplain, discharge volume, or effluent water quality under the no action alternative. The existing spray field would continue to operate within the 100-year floodplain of lower McDonald Creek and the Middle Fork of the Flathead River and would pose minimal flooding risk because above ground features are limited to sprinkler heads. High spring flows or saturated soils would limit the ability to apply effluent during wet years. Because the volume of effluent applied to the spray field would be similar to existing operations (up to 250,000 gpd), there would be no change in the volume or timing of runoff to McDonald Creek.

Treated effluent water quality would be similar to existing conditions and would not adversely affect water quality in lower McDonald Creek or the

Middle Fork of the Flathead River. Water quality discharges would continue to meet state water quality standards. Based on historical data (NPS 1992), phosphorus levels in ground water would meet TMDL criteria and would not adversely affect Flathead Lake. Deterioration of the operational efficiency of the plant has resulted in an increase in the BOD and suspended sediment in the discharged effluent since the original WWTP was constructed. Continued deterioration of the facilities' ability to treat up to original design standards would occur without rehabilitation. An adverse effect to water quality is possible under the no action alternative due to increased demand on the current system to handle an increasing amount of effluent, especially as the existing facility ages and becomes less efficient. Accidental spills from the lagoon may occur during wet springs when effluent cannot be discharged to the spray field. Partially treated sewage effluent could reach lower McDonald Creek and the Middle Fork of the Flathead River during these events. Such discharges would violate state water quality standards.

Cumulative Effects

Planned future improvements to the Park's wastewater collection system in addition to the proposed wastewater plant rehabilitation would improve water quality in lower McDonald Creek and the Middle Fork of the Flathead River. Potential future connection of sewer lines and abandonment of existing septic systems on private residences in the Park near Lake McDonald also would improve water quality. Previous work on pump stations at Lake McDonald Lodge, Sprague Creek, and Apgar, and elimination of Park septic systems has also contributed to improved water quality in lower McDonald Creek and the Middle Fork of the Flathead River and reduced the risk of contamination from equipment failure.

Cumulative negative impacts to water quality in the Flathead River system are possible with other nutrient and pollutant introductions from sources outside the Park. Potential sources of other pollutants to the Flathead River include septic systems, other WWTPs, industrial discharges, and non-point sources such from agricultural runoff, forestry practices, and roads. MDEQ uses the Pollutant Discharge Elimination Permit to regulate basinwide pollution concerns. Total maximum daily load is used to apportion allowable pollutant discharge levels among various discharges to protect stream water quality at the point of discharge.

Ongoing water conservation measures, which include the repair or replacement of sewage collection lines and use of low-water use fixtures, will reduce water use in the Park and potentially wastewater treatment demands.

Wild and Scenic Rivers

Alternative 1A — Lagoon Treatment, Sprinkler Discharge, Additional Spray Field

The existing spray field is the only component of this alternative that would be located in the Wild and Scenic River corridor and 100-year floodplain. There would be no change to existing physical features and no impacts to hydrological or biological resources in the Middle Fork of the Flathead River. Water quality discharge would meet state non-degradation standards. Improvements to the wastewater system under this alternative would not lessen the values and qualities inherent with the Middle Fork segment of the Wild and Scenic River and would not affect the free-flowing status of the river.

Alternative 1B — Lagoon Treatment, Sprinkler Discharge, Additional Storage

As with Alternative 1A, the existing spray field is the only component of this alternative that would be located in the Wild and Scenic River corridor. Improvements to the wastewater system under Alternative 1B would not lessen the values and qualities inherent with the Middle Fork segment of the Wild and Scenic River and would not affect the free-flowing status of the river.

Alternative 2 — Advanced Wastewater Treatment Plant, Rapid Infiltration Basin Discharge

None of the components of this alternative would be located in the Wild and Scenic River corridor. Discharge of treated effluent to the ground water may reach the Middle Fork of the Flathead River, but the quality of discharges would not adversely affect water quality in the river. Improvements to the wastewater system under Alternative 2 would not lessen the values and qualities inherent with the Middle Fork segment of the Wild and Scenic River and would not affect the free-flowing status of the river.

Alternative 3 — Preferred Alternative — Advanced Wastewater Treatment Plant, Land Discharge

The discharge outlet is the only portion of this alternative that would be located within the Wild and Scenic River corridor of the Middle Fork of the Flathead River. Construction of the exfiltration gallery in the 100-year floodplain of the Middle Fork would temporarily disturb less than 0.4 hectare (1 acre) of vegetation and soils during construction. The exfiltration gallery is located 100 feet from the Middle Fork streambank outside of the 10-year floodplain. Because the exfiltration gallery is located below grade and the site would be revegetated, there would only be a temporary impact to scenic values near the discharge site.

There would be no impact to channel morphology, streambank erosion, sediment routing or debris loading. The timing of discharges would differ slightly from existing conditions because the WWTP would operate year-round. None of the proposed project features would affect the free-flowing status of the Middle Fork. Biological processes in the Middle Fork would not be adversely affected due to the high quality of effluent discharges. Water quality in the Middle Fork would meet federally approved state non-degradation standards. Recreational activities in the Middle Fork would not be adversely affected by the proposed discharge outlet because there would be no impact to water quality or the free-flowing status of the river, and only minor temporary disturbance to scenic values.

Proposed wastewater system improvements would not appreciably lessen the outstanding and remarkable values and qualities inherent with this recreational segment of the Wild and Scenic River and would not affect the free-flowing status of the river.

Alternative 4 — No Action

Continued use of the existing spray field would occur within the Middle Fork Wild and Scenic River corridor under the no action alternative. There would be no effect to Wild and Scenic River values on the Middle fork of the Flathead River because the existing operation does not adversely affect water quality.

Vegetation

Alternative 1A — Lagoon Treatment, Sprinkler Discharge, Additional Spray Field

A long-term loss of 1.2 hectares (3 acres) of vegetation would occur with the construction of a new lagoon. Creation of an additional spray field would require removal of lodgepole pine forest and understory on 5.3 hectares (13 acres). Existing vegetation in the spray field would be replaced with native grassland species suitable for uptake of nutrients in the treated effluent. The application of treated effluent would increase forage production. Increased weed or exotic plant invasion is possible, but use of native plants for revegetation and monitoring would minimize weed establishment. There would be a long-term change in the plant community at the spray field site. Creation of a new meadow would add to the plant and habitat diversity of the area, but would modify the existing naturally occurring plant communities and succession to a hemlock forest.

Alternative 1B — Lagoon Treatment, Sprinkler Discharge, Additional Storage

Construction of new lagoons would require the removal and long-term loss of vegetation resources on 3.6 hectares (9 acres) of land. The existing lodgepole pine forest would be harvested and all understory vegetation removed to excavate the lagoons. The lagoon sites would be near the existing lagoon, parking area, and utility rights-of-ways that are cleared of forest overstory. The loss of vegetation in proximity to previously disturbed areas is relatively minor; however, loss of vegetation resources would reduce available habitat for wildlife and fragment surrounding habitat. Pipeline construction would result in a temporary disturbance to vegetation. Disturbed areas would be promptly revegetated following construction with suitable native plant material.

Alternative 2 — Advanced Wastewater Treatment Plant, Rapid Infiltration Basin Discharge

Construction of three infiltration basins would result in the long-term loss of 3.6 hectares (9 acres) of vegetation. The lodgepole pine forest community would be removed from production and succession to hemlock forest would not occur. The infiltration basins would be located adjacent to an existing cleared utility line. The loss of vegetation resources would reduce available habitat for wildlife and fragment surrounding habitat. Pipeline construction would result in minor temporary disturbance to vegetation. Disturbed areas would be revegetated with native plants following construction.

Alternative 3 — Preferred Alternative —Advanced Wastewater Treatment Plant, Land Discharge

Minor disturbance to vegetation resources would occur from implementation of this alternative. A new wastewater treatment building would be located in an existing unvegetated parking area and would not affect vegetation. Installation of an exfiltration gallery would disturb temporarily about 0.4 hectares (1 acre) of upland grassland in the floodplain adjacent to the Middle Fork of the Flathead River. Following construction of the exfiltration gallery, the site would be revegetated with native plant species.

Alternative 4 — No Action

There would be no change in vegetation resources in the vicinity of the existing wastewater treatment facilities.

Cumulative Effects

Past actions to construct the existing sewage treatment facility, maintenance storage yard, utility line corridor, roads and explosive magazine have contributed to the modified condition of the existing vegetation communities in the area. Alternative improvements to the wastewater treatment facility would add varying degrees of additional disturbance to this area. There are no other known planned disturbances to vegetation in the immediate vicinity of the project area. A new Discovery Center proposed in the General Management Plan (NPS 1999) would require vegetation clearing about 1.5 kilometers (1 mile) north of the project area between Apgar Village and the Apgar Campground. Future repair or replacement of sewage collection lines in the Park could temporarily disturb vegetation for all alternatives.

Wildlife and Aquatic Resources

Alternative 1A — Lagoon Treatment, Sprinkler Discharge, Additional Spray Field

Construction of a new lagoon would result in the loss of 1.2 hectares (3 acres) of wildlife habitat. Vegetation at a new 5.3-hectare (13-acre) spray field would change from lodgepole pine forest to a grassland meadow. The change in habitat may be beneficial to some species such as foraging elk and deer and grassland birds, and less favorable to cavity nesting birds and forest dwelling species. The loss of forest cover may reduce potential sites for elk calving. The new lagoon would be fenced to prevent human and wildlife access. The spray field also would be fenced, but this would not be a barrier for most wildlife movement into the spray field.

Construction-related disturbances to wildlife would be temporary and limitations in the seasonal and daily construction schedule would minimize effects. Outside construction would occur between June 1 and December 1 to minimize disturbance during elk calving season in the area. Indoor construction could occur year-round. Restricting construction activities to daylight hours would minimize impacts to wildlife use at night. Overall, minor adverse effects to wildlife may occur with this alternative.

Potential effects to fisheries would be similar to current conditions. Spray field applications of treated effluent in the existing and new spray field would meet water quality standards and would not affect fisheries in lower McDonald Creek or the Middle Fork of the Flathead River based on existing water quality data (Hauer 1988; NPS 1992). The new spray field, which is located upstream from the existing spray field (Figure 3) would discharge treated effluent into lower McDonald Creek alluvial ground water in an area not previously receiving effluent. Hyporheic communities

in the vicinity of the lower McDonald Creek oxbow may be adversely affected by these discharges, based on results at other sites (Noble and Stanford 1986; Gilbert et al. 1994).

Alternative 1B — Lagoon Treatment, Sprinkler Discharge, Additional Storage

Proposed construction of a new lagoon would result in the long-term loss of 3.6 hectares (9 acres) of forested wildlife habitat. The new lagoons would be fenced to exclude wildlife for their protection. There would be a loss in wildlife habitat for foraging, nesting, breeding, and cover. Fragmentation of wildlife habitat would occur with construction of three separate lagoons, and wildlife activity in the area may decrease due to the loss of habitat and additional human activity in the area. Due to their proximity to existing facilities, the new lagoons are unlikely to have a substantial effect on wildlife movement. Overall, minor adverse effects to wildlife populations or use of the area may occur. Wildlife would need to make local adjustments to the loss of habitat. Unnatural habitat alterations from use of the existing wastewater spray field would continue.

Wildlife activity near the lagoon may be reduced during construction due to noise and the level activity at the site. Existing activities at the wastewater facility currently limit wildlife activity during the day. Temporary impacts to wildlife during construction would be minimized by restrictions in the season and timing of construction as described for Alternative 1A.

The proposed new lagoons are not likely to adversely affect fisheries because proposed improvements would not directly affect fishery habitat in lower McDonald Creek or the Middle Fork of the Flathead River. The increased storage and efficiency of an improved wastewater treatment facility and the reduced potential for accidental untreated sewage spills would benefit fisheries. Stream water quality would be similar to existing conditions and would meet state water quality standards. There would be no impairment to the current Montana DEQ aquatic life use designation of lower McDonald Creek or the Middle Fork of the Flathead River. There would be no change in streamflow, channel substrate, water temperature or other parameters that would affect fisheries.

There would be no substantial change in subaquatic invertebrates that may be present in the alluvial ground water of lower McDonald Creek and the Middle Fork of the Flathead River. The existing spray field would continue to be used for effluent discharge at application rates and water quality similar to historical levels. It is possible that the hyporheic community has been adversely affected by previous effluent discharges in the existing spray field (Stanford 1999), but this has not been studied. The

hyporheic community is extremely sensitive to nutrient pollution. Studies on the Flathead River, near Kalispell, Montana indicate that the hyporheic community was eliminated at sewage-affected areas of the riverine aquifer (Noble and Stanford 1986). Similar results have been documented at other locations (Gilbert et al. 1994). Any adverse effects to the hyporheic community at the existing spray field by past effluent discharge would continue.

Alternative 2 — Advanced Wastewater Treatment Plant, Rapid Infiltration Basin Discharge

The construction of rapid infiltration basins would result in the long-term loss of about 3.6-hectare (9 acres) of wildlife habitat. Potential effects to wildlife would be similar to Alternative 1B except the basins would be located in an area with less existing disturbance (Figure 5). The fenced basins would prevent most wildlife from entering the site for their protection. The configuration of the basins would result in a minor change in wildlife movement in the area. Overall, a minor effect to wildlife would occur due primarily to the loss in habitat. Temporary impacts to wildlife during construction would be minimized by restrictions in the season and timing of construction as described for Alternative 1A. Substantial adverse effects to wildlife populations or use of the area are unlikely.

Adverse effects to fishery resources are unlikely from this alternative due to the high quality of the effluent and the discharge to ground water. Advanced wastewater treatment would reduce the amount of nutrients in the effluent and water quality in lower McDonald Creek would meet state water quality standards.

Potential effects to subaquatic invertebrates are possible within the zone of influence downstream from the infiltration basin. The extent and severity of this impact would be similar to Alternatives 1A and 1B, but effluent discharges to ground water would be more rapid and concentrated at a smaller location than spray field applications. Discontinued use of the existing spray field could improve the water quality and habitat conditions for hyporheic communities in this area.

Alternative 3 — Preferred Alternative — Advanced Wastewater Treatment Plant, Land Discharge

This alternative would have the least adverse effect of all alternatives on wildlife resources due to the lack of ground disturbance and the removal of the wastewater spray field. There would be no loss of wildlife habitat from construction of a new wastewater treatment building. The exfiltration gallery site would disturb about 0.4 hectares (1 acre) of

grassland habitat temporarily, but would not substantially affect existing wildlife habitat following revegetation.

Outside construction would occur between June 1 and December 1 to minimize disturbance during elk calving season in the area. Indoor construction could occur year-round. Restricting construction activities to daylight hours would minimize impacts to wildlife use at night.

Fishery resources and subaquatic invertebrates are unlikely to be adversely affected due the high level of treatment and discharge to alluvial ground water. Effluent discharges would meet state non-degradation water quality standards. The treated effluent quality for this alternative would have the least potential impact to the hyporheic community. Discontinued use of the existing spray field may result in improved conditions for hyporheic communities in this area.

Alternative 4 — No Action

There would be no change in existing wildlife habitat under the no action alternative. Wildlife would continue to use habitat in the spray field and surrounding areas as they have in the past and other wildlife would continue to be displaced. Existing facilities and human activity in the area would continue to affect wildlife activity.

There would be no change in the existing aquatic habitat or quality of treated effluent under the no action alternative. Fishery resources would not be adversely affected because existing discharges meet state water quality standards and increased nutrient concentrations have not been detectable in the ground water or surface water (Hauer 1988; Glacier National Park 1992). Subaquatic invertebrate habitat may continue to be affected by use of the existing spray field.

Cumulative Effects

Planned future repair or replacement of wastewater collection system lines may improve the water quality in the lower McDonald Creek drainage. This would be a beneficial effect to aquatic resources for all of the alternatives. Existing private land development on the Middle Fork and other tributaries of the Flathead River also contribute nutrients from septic systems, municipal wastewater treatment plants, as well as other point and non-point sources. Future residential and commercial growth in the region is likely to increase the amount wastewater discharges to the Flathead basin. Incremental discharges to the Flathead basin could potentially affect aquatic resources in the future. However, planned nutrient discharges associated with any of the WWTP alternatives are less than or equal to historical discharges from the Park.

Threatened and Endangered and State Sensitive Species

Alternative 1A — Lagoon Treatment, Sprinkler Discharge, Additional Spray Field

Wildlife and Aquatic Resources

Bald eagle. Bald eagles may be affected, but are unlikely to be adversely affected due to the timing of construction and the location of project facilities away from potential eagle use areas on lower McDonald Creek. The highest use period for bald eagles in the vicinity of the project area is in the spring and fall. Construction activity would be restricted between June 1 and December 1 and to the hours of 7:00 a.m. to 8:00 p.m. to minimize potential effects to bald eagles.

Gray wolf. There would be a loss of about 1.2 hectares (3 acres) of habitat with little anticipated change in ungulate prey populations under this alternative. Wastewater treatment plant improvements may affect, but are not likely to adversely affect gray wolves because there is minimal use of the project area and minimal loss of suitable habitat.

Grizzly bear. The project area includes suitable habitat for grizzly bears and there would be a loss of about 1.2 hectares (3 acres) of habitat from construction of new lagoons and a change in habitat on 5.3 hectares (13 acres), where a new spray field meadow would be created. Grizzlies may be attracted to the new spray field due to the herbaceous growth in an irrigated meadow. Construction-related effects would be mitigated in a similar manner as described under the preferred alternative. Grizzly bears may be affected by the loss of habitat, but are unlikely to be adversely affected due to the existing disturbance and activity in the area and mitigation measures.

Bull trout. There would be no change in habitat elements or direct impacts to physical features in the Middle Fork or lower McDonald Creek. Hydrologic conditions and flows in these drainages would be similar to existing conditions. Anticipated spray application of wastewater effluent would not adversely affect water quality in lower McDonald Creek or the Middle Fork of the Flathead River. Following review by Park Service aquatic biologists, it was determined that spray field discharges would not affect bull trout. As a result, actions under this alternative would have no effect on bull trout use of lower McDonald Creek or other habitat in the Middle Fork of the Flathead River.

Lynx. The 1.2-hectare (3-acre) loss in habitat would have a minor effect on snowshoe hares, lynx principal prey. This alternative is unlikely to adversely affect lynx movement, hunting or other activities due to their limited use of the project area and small area of impact. Alternative 1A

may affect, but is not likely to adversely affect, lynx activity in the project area.

Marten, fisher and wolverine. These mammals may use habitat in the vicinity of the project area. The 5.3 hectare (13-acre) change in habitat from forest to meadow would reduce the habitat available for these woodland species. The construction of the new 1.2-hectare (3-acre) lagoon also would contribute to the loss of habitat. Loss of habitat is an adverse effect, but it is anticipated to be minimal as these species are wide ranging and no construction would occur at night when they are most active. This alternative is not likely to lead to a federal listing or loss in species viability.

Trumpeter swan, harlequin duck, osprey, northern goshawk, Cooper's hawk, northern pygmy owl, barred owl, northern saw-whet owl, and pileated woodpecker. The lands surrounding the project area provide potential habitat for all of these species. There are no known nest sites in the vicinity of the wastewater facility. These species may limit their use of foraging habitat in the project area during construction, but this is not likely to result in an adverse impact. This alternative is not likely to lead to a federal listing or loss in species viability.

Plant Species

There would be no effect to federally listed threatened or endangered plant species under this alternative because there are no known listed plant species in the Park. A population of the state threatened velvetleaf blueberry is located near the existing lagoon. Although the new lagoons would be sited to minimize impacts to the velvetleaf blueberry, construction of the new lagoon east of the existing lagoon could result in the loss of a few individual velvetleaf blueberry plants. The loss of fewer than 10 of these plants would not substantially affect the viability of the Park population or lead to a federal threatened or endangered species listing according to Park ecologists. Velvetleaf blueberry in the vicinity of the lagoon and spray field would be marked and barricaded to prevent any accidental disturbance during construction.

Alternative 1B — Lagoon Treatment, Sprinkler Discharge, Additional Storage

Wildlife and Aquatic Resources

Bald eagle. Bald eagles may be affected, but are not likely to be adversely affected by this alternative due to the timing of construction and the location of project facilities away from potential eagle use areas on lower McDonald Creek.

Gray wolf. There would be a loss of about 5.3 hectares (9 acres) of habitat with little anticipated change in ungulate prey populations as a result of the preferred alternative. Wastewater treatment plant improvements may affect, but are not likely to adversely affect gray wolves because there is minimal use of the project area.

Grizzly bear. The project area includes suitable habitat for grizzly bears and there would be a loss of about 5.3 hectares (9 acres) of habitat from construction of new lagoons. The loss of habitat due to lagoon construction may affect, but is not likely to adversely effect grizzly bears. Construction-related effects would be mitigated in a manner similar to the preferred alternative.

Bull trout. There would be no change in habitat elements or direct impacts to physical features in the Middle Fork or lower McDonald Creek. Hydrologic conditions and flows in these drainages would be similar to existing conditions. Anticipated spray application of wastewater effluent would be similar to existing use and would not adversely affect water quality in lower McDonald Creek or the Middle Fork of the Flathead River. Following review by Park Service aquatic biologists, it was determined that spray field discharges would not affect bull trout. This alternative would have no effect on bull trout use of lower McDonald Creek or other habitat in the Middle Fork of the Flathead River or Lake McDonald.

Lynx. The 3.6 hectare (9-acre) loss in habitat would have a minor effect to snowshoe hares, lynx principal prey. Preferred alternatives are unlikely to affect lynx movement, hunting or other activities due to their limited use of the project area and the small area of disturbance. Alternative 1B may affect, but is not likely to adversely affect lynx activity in the project area.

Marten, fisher and wolverine. These mammals may use habitat in the vicinity of the project area. Adverse effects to these species are not likely because the project would result in a minor loss of habitat 3.6 hectare (9 acres) and no construction would occur at night when they are most active. This alternative is not likely to lead to a federal listing or loss in species viability.

Trumpeter swan, harlequin duck, osprey, northern goshawk, Cooper's hawk, northern pygmy owl, barred owl, northern saw-whet owl, and pileated woodpecker. The lands surrounding the project area provide potential habitat for all of these species. There are no known nest sites in the vicinity of the wastewater facility. These species may limit their use of foraging habitat in the area during construction, but this is not likely to result in an adverse effect. This alternative is not likely to lead to a federal listing or loss in species viability.

Plant Species

There would be no effect to threatened or endangered plant species from this alternative because there are no known federally listed plant species in the Park. A population of state threatened velvetleaf blueberry is located near the existing lagoon. Although the location of new lagoons were sited to minimize impacts to velvetleaf blueberry, construction of the new aerated lagoon east of the existing lagoon could result in the loss of a few individual velvetleaf blueberry plants. The loss of fewer than 10 plants would not substantially reduce the number of plants in the Park or adversely affect the viability of the population according to Park ecologists. This loss would not lead toward federal listing of velvetleaf blueberry as threatened or endangered because the species is globally secure. New storage lagoons would not affect the velvetleaf blueberry. Velvetleaf blueberry in the vicinity of the lagoon sites would be marked and barricaded to prevent any accidental disturbance during construction.

Alternative 2 — Advanced Wastewater Treatment Plant, Rapid Infiltration Basin Discharge

Wildlife and Aquatic Resources

Bald eagle. This alternative may affect, but is not likely to adversely affect bald eagles due to the lack of habitat in the project area and anticipated mitigation measures discussed for the preferred alternative.

Gray wolf. There would be a loss of about 5.3-hectare (9 acres) of habitat and no change in ungulate prey base populations from the preferred alternative. Construction of infiltration basins may affect, but is not likely to adversely affect gray wolves because there is minimal use of the project area.

Grizzly bear. There would be a loss of about 5.3-hectare (9 acres) of habitat from construction of infiltration basins. Grizzly bear attraction to the abandoned spray field may diminish when irrigation is discontinued. Adverse effects to grizzly bears are not likely as discussed under the preferred alternative. Construction-related effects would be mitigated in a similar manner to the preferred alternative. The loss and change in habitat under Alternative 2 may affect, but is unlikely to adversely affect grizzly bear.

Bull trout. There would be no change in habitat elements or direct impacts to physical features in the Middle Fork or lower McDonald Creek. Hydrologic conditions and flows in these drainages would be similar to existing conditions. Advanced wastewater treatment would improve water quality of treated discharge above existing conditions. Anticipated infiltration releases of wastewater effluent would not adversely affect

water quality in lower McDonald Creek or the Middle Fork of the Flathead River. Following review by Park Service aquatic biologists, it was determined that infiltration basin discharges would not affect bull trout. As a result, this alternative would have no effect on bull trout use of lower McDonald Creek or other habitat in the Middle Fork of the Flathead River or Lake McDonald.

Lynx. Alternative 2 may affect, but is not likely to adversely affect lynx movement, hunting or other activities due to the small area of disturbance and limited lynx activity in the vicinity of the project area. The 3.6 hectare (9-acre) loss in habitat from infiltration basin construction would have a minor effect on snowshoe hares, lynx principal prey.

Marten, fisher and wolverine. These mammals may use habitat in the vicinity of the project area. Adverse effects to these species are not likely because the project would result in a minor loss of 5.3 hectare (9 acres) of habitat and no construction would occur at night when they are most active. Alternative 2 is not likely to lead to a federal listing or a loss in species viability.

Trumpeter swan, harlequin duck, osprey, northern goshawk, Cooper's hawk, northern pygmy owl, barred owl, northern saw-whet owl, and pileated woodpecker. The lands surrounding the project area provide potential habitat for all of these species. There are no known nest sites in the vicinity of the infiltration basins. These species may limit their use of foraging habitat in the area during construction, but this is not likely to result in an adverse effect. Alternative 2 is not likely to lead to a federal listing or a loss in species viability.

Plant Species

There would be no effect to threatened or endangered plant species under this alternative because there are no known federally listed plant species in the Park. A population of the state threatened velvetleaf blueberry plants is located south of the existing lagoon, but outside of the construction area. Velvetleaf blueberry in the vicinity of the project area would be marked and barricaded to prevent any accidental disturbance during construction.

Alternative 3 — Preferred Alternative — Advanced Wastewater Treatment Plant, Land Discharge

The proposed improvements to the wastewater treatment facility are not likely to adversely affect threatened, endangered or state sensitive plant or animal species. The following discussion addresses potential effects to each species.

Wildlife and Aquatic Resources

Bald eagle. This alternative may affect but is not likely to adversely affect bald eagles because there would be no loss of habitat or long-term disturbance near bald eagle use areas. Construction would occur between June 1 and December 1 to minimize any potential effects to wintering bald eagles. Daily outdoor construction activity would be limited to between 7:00 a.m. and 8:00 p.m. to minimize impacts to morning and evening bald eagle foraging.

Gray wolf. The project area is not located within known gray wolf home range. Wolves may occasionally hunt or roam through the project area, but their activity appears to be limited. There would be no loss of habitat and no change in ungulate prey base populations under this alternative. Construction of a new wastewater treatment building and installation of a discharge outlet may affect, but are not likely to adversely affect gray wolves because of their limited activity in the project area and the minimal habitat disturbance.

Grizzly bear. Grizzlies are wide-ranging species and construction is proposed for a small site in an existing area of development and human presence. Grizzly bears foraging in the area at night would not be displaced by planned daytime construction activities, but bears that use the area during the day could be displaced.

Temporary construction activities may add to existing human activities in the area that displace or habituate grizzlies, but the potential to affect grizzly bears is expected to be minor. Although grizzly bears typically avoid areas of human activity, they are attracted to food, the scent of some petroleum products, and human waste. Bear attraction to the existing sewage lagoon has not been a problem and is unlikely to change with additional lagoons.

Several management measures would be used to minimize the potential for bear/human conflicts during construction. Specifications for storage and disposal of food, construction materials, petroleum products, and human waste and other possible attractants would be incorporated into the construction contract to minimize the potential for impacts. Construction personnel would be trained in how to behave in the presence of bears. Should a habituated bear frequent the area, construction activities may be temporarily suspended while management actions are implemented.

There would be no loss of grizzly bear habitat from construction of the wastewater treatment building and the discharge outlet. Grizzly bear attraction to the spray field may diminish when irrigation is discontinued. The preferred alternative may affect, but is not likely to adversely affect the grizzly bear because there would be no loss in habitat and mitigation measures would reduce the potential for substantial impacts.

Bull trout. Bull trout are known to use lower McDonald Creek as a travel corridor between the Middle Fork of the Flathead River and Lake McDonald, although there is no known spawning in lower McDonald Creek or the Middle Fork in the vicinity of the project area. There would be no change in habitat elements or direct impacts to physical features in the Middle Fork or lower McDonald Creek. Hydrologic conditions and flows in these drainages would be similar to existing conditions.

Anticipated discharges of wastewater effluent would meet state water quality standards and not adversely affect water quality in the Middle Fork of the Flathead River or lower McDonald Creek. Advanced wastewater treatment would improve the quality of water discharged over existing conditions. Following review by Park Service aquatic biologists, it was determined that exfiltration discharge would not affect bull trout due to the high quality of the discharge to ground water and the lack of impact to bull trout habitat. The proposed action would have no effect on bull trout use of these streams or other habitat in the Flathead River watershed due to the high quality of the alluvial ground water discharge and the lack of impact to bull trout habitat.

Lynx. Lynx are wide-ranging species with unknown population numbers in the Park. Sightings and track reports are rare in the vicinity of the project area but there have been no intensive surveys to document lynx use in this area. Because lynx are generally nocturnal and construction activities would occur during the daylight hours, any lynx that may periodically use the area are unlikely to be adversely affected by construction of an enlarged WWTP building and discharge outlet. This alternative may affect, but is not likely to adversely affect lynx movement, hunting or other activities due the small area of disturbance and their limited use of the project area. There would be no loss in habitat from wastewater treatment facility location or discharge outlet installation.

Marten, fisher and wolverine. These mammals may use habitat in the vicinity of the project area. Adverse effects to these species are not likely because the project would not result in a loss of habitat and no construction would occur at night when they are most active. The preferred alternative is not likely to lead to a federal listing or a loss in species viability.

Trumpeter swan, harlequin duck, osprey, northern goshawk, Cooper's hawk, northern pygmy owl, barred owl, northern saw-whet owl, and pileated woodpecker. The lands surrounding the project area provide potential habitat for all of these species. There are no known nest sites in the vicinity of the project area. These species may limit their use of foraging habitat in the area during construction, but this is not likely to

result in an adverse effect leading to a federal listing or loss of species viability.

Plant Species

There would be no effect to threatened or endangered plant species under the preferred alternative because there are no known federally listed plant species in the Park. A population of the state threatened velvetleaf blueberry is located near the existing lagoon, but outside of the proposed area for construction. Velvetleaf blueberry in the vicinity of the project area would be marked and barricaded to prevent any accidental disturbance during construction.

Alternative 4 — No Action

Under the no action alternative, there would be no change in the current use of habitat in the project area by bald eagles, grizzly bear, gray wolf, bull trout, or lynx. Continued operation of the existing wastewater treatment facility is unlikely to adversely affect these species. Water quality from spray field applications of effluent would continue to meet state water quality standards. However, occasional accidental spills of partially treated sewage effluent during wet years could reach lower McDonald Creek and the Middle Fork of the Flathead River. This potentially could adversely affect bull trout for short periods of time.

No state sensitive wildlife species are adversely affected by existing WWTP operations. No effect to federal threatened or endangered or state sensitive plant species is expected under no action because there would not be any ground-disturbing activities.

Cumulative Effects

There are no known adverse long-term or cumulative effects to threatened, endangered, or rare state species associated with action or no action alternatives, with the exception of bull trout. Previous wastewater system improvements in the Park have improved the quality of water in the Lake McDonald and lower McDonald Creek drainages. Cumulative actions from future wastewater collection system improvements in the Park may result in a long-term benefit to these species in Lake McDonald and lower McDonald Creek. Wastewater or other discharges from private lands outside of the Park may decrease water quality that could affect bull trout in the Flathead River drainage.

Visual Resources

Alternative 1A — Lagoon Treatment, Sprinkler Discharge, Additional Spray Field

Impacts to visual quality would occur with construction of a new 1.2-hectare (3-acre) lagoon. The addition of a new 5.3-hectare (13-acre) spray field would require clearing the forest vegetation and establishing a grassland meadow. Creation of a new meadow would add some diversity to the landscape, although the site would be fenced and may appear artificial rather than natural. Mitigation could include selective harvesting to create a more natural appearing opening. Existing forest cover would screen this site from lower McDonald Creek and surrounding lands. The new lagoon and spray field may be visible from trails in the project area.

Alternative 1B — Lagoon Treatment, Sprinkler Discharge, Additional Storage

Construction of new lagoons requires clearing the existing forest and would result in the addition of 3.6 hectares (9 acres) of constructed features into the landscape. The visual quality of the site would be diminished, but placement of the site near the existing facilities would minimize the effect. Surrounding forest screens this area from adjacent lands. The new lagoons may be visible from trails in the project area.

Alternative 2 — Advanced Wastewater Treatment Plant, Rapid Infiltration Basin Discharge

Construction of rapid infiltration basins would require clearing 3.6 hectares (9 acres) of forest. The three excavated basins would be surrounded by earthen berms and would be fenced. Visual quality of the area would be diminished, but existing disturbances, including the current sewage lagoon, is located nearby. The new infiltration basins may be visible from trails in the project area.

Alternative 3 — Preferred Alternative —Advanced Wastewater Treatment Plant, Land Discharge

Minimal effect to the existing landscape would occur with this alternative. A new larger building would be constructed near existing disturbed areas and would not substantially change the visual quality of the area. Construction of the exfiltration discharge outlet would result in a temporary surface disturbance, but there would be no long-term change to visual quality. The buried pipeline to the exfiltration gallery would result in a temporary visual disturbance during construction, although the majority of the pipeline would be within existing roads.

Alternative 4 — No Action

There would be no change in the existing visual quality of the landscape under the no action alternative. The existing spray field and lagoon would stay in operation and would be visible to visitors along the Quarter Circle Bridge Road.

Cumulative Effects

All modifications to the landscape from action alternatives result in a minor long-term change to the visual quality of the land. Existing disturbances in the project area are part of the cumulative effects to the visual quality of the site. Future repair or replacement of sewage collection lines could temporarily affect visual quality during construction. There are no other known future activities that would add to the cumulative effects of the alternatives.

Noise and Odor

Alternative 1A — Lagoon Treatment, Sprinkler Discharge, Additional Spray Field

Noise levels at the new lagoon would be similar to existing conditions. A new spray field would have minor increases in noise during the operation of sprinklers and periodic maintenance visits. Sound from the spray field may be detected by Park visitors and nearby trails. A temporary increase in noise levels would occur during construction of the lagoon, clearing the forest, and installation of pipelines. These temporary increases in noise levels during construction may be perceptible to recreationists along lower McDonald Creek. Planned restrictions in construction activities would limit the increased noise levels to daylight hours.

Odors from a new lagoon would sometimes be perceptible in the immediate area surrounding the lagoon depending on climatic conditions and operating factors. Maintenance workers would monitor odors and lagoon operation to minimize odor problems. Recreation users on lower McDonald Creek or near Quarter Circle Bridge are unlikely to detect odors from the lagoon during normal operations. There would be minimal odor associated with the new spray field.

Alternative 1B — Lagoon Treatment, Sprinkler Discharge, Additional Storage

Noise associated with new lagoons would be similar to the existing lagoon. Generally, noise levels are low and include primarily the aeration pumps. The noise from the operation of the lagoons and WWTP is not likely to adversely affect wildlife or human activities. There would be a temporary increase in noise levels during construction that may be

perceptible to recreationists along lower McDonald Creek and the nearby horse trail. Planned restrictions in construction activities would limit the increased noise levels to daylight hours.

Odors from the new lagoon would be similar to those described for Alternative 1A although additional lagoon storage increases the potential for odors.

Alternative 2 — Advanced Wastewater Treatment Plant, Rapid Infiltration Basin Discharge

No substantial change in noise levels are anticipated with the operation of the infiltration basins. A new advanced wastewater treatment building would house new facilities and contain mechanical noises. Park visitors are unlikely to perceive any noise associated with this facility. Temporary noise increases and mitigation during construction would be similar to Alternatives 1A and 1B.

Odors from operation of the infiltration basins and treatment facility are expected to be minor. Odors from a new lagoon would sometimes be perceptible in the immediate area surrounding the lagoon depending on climatic conditions and operating factors. Sludge from the operation of the advanced wastewater facility can generate obnoxious odors if not properly disposed. Wastewater treatment plant operations would dispose of sludge at a suitable facility, capable of handling such waste, outside of the Park.

Alternative 3 — Preferred Alternative — Advanced Wastewater Treatment Plant, Land Discharge

There would be limited noise associated with this alternative. Treatment facilities would be located within a building that would contain mechanical noise. No sound from the facility would be detectable by Park visitors. Construction of the WWTP and discharge outlet would result in a temporary increase in noise.

Odors from this wastewater treatment facility are expected to be minor. The advanced biological treatment of waste would not generate substantial odors. Sludge from the operation of the advanced wastewater facility can generate obnoxious odors if not properly disposed. Wastewater treatment plant operations would dispose of sludge at a suitable facility, capable of handling such waste, outside of the Park.

Alternative 4 — No Action

Under no action, there would be no change in existing noise levels. Motor and pumping noise from the lagoon would be minor and generally not detectable to Park visitors.

Odors from the lagoon would be minimal under normal operating conditions.

Cumulative Effects

Noise from each of the alternatives would result in long-term contributions to the ambient noise levels. Maintenance activities and traffic in the vicinity of the project contribute to the existing noise level. Ongoing repair or replacement of sewage collection lines could result in temporary elevated noise levels during construction. There are no known future activities that would result in cumulative effects to sound levels in the region.

Odor from alternative wastewater treatment plant options would occur over the long-term. No cumulative effects to odor in the area were identified.

4.2 Socioeconomic Environment

Visitor Use and Experience

All Action Alternatives

The preferred alternative and other action alternatives would have minimal direct effects on visitor use and experience. Proposed project facilities would be located in an area not generally accessible or used by Park visitors. Construction of the discharge outlet for Alternative 3 may require a temporary closure of the Quarter Circle Bridge Road for construction of an exfiltration gallery. This action may restrict visitor access for several weeks to hiking trails, fishing and boater take-out on lower McDonald Creek. Horseback trail rides to the abandoned Flathead River Ranger Station or Apgar Lookout would be suspended during construction. Hikers, anglers, and boaters most likely would use another area of the Park for recreation until construction activities are completed.

Alternatives 1A, 1B, and 2 would require rerouting a segment of a horse and concessioner/foot trail that is located within the disturbance zone for a new lagoon, spray field, or infiltration basin. Relocation of the trail would result in additional land disturbance and may affect the quality of the visitor experience for trail users.

Construction of wastewater treatment improvements would indirectly benefit Park visitor and experience by allowing continued operation of Park facilities, campgrounds and lodges dependent on an adequate sewage disposal facility.

Alternative 4 — No Action

Continued operation of the existing wastewater treatment system is not expected to directly affect visitor use and experience. However, if the existing WWTP is unable to meet demand due to lack of storage, operation of some Park facilities or concessions could be restricted to reduce water use. This could affect visitor use and experience in the early spring.

Cumulative Effects

Proposed and alternative wastewater treatment system improvements would provide long-term benefits to Park visitor use and experience by being able to meet sewage treatment demands as currently envisioned in the Park General Management Plan (NPS 1999). The rehabilitation of the wastewater treatment facility would allow future construction of a new Discovery Center. Cumulative future benefits to visitors are possible from improvements in Lake McDonald water quality because the new facility

would allow for discontinued use of private septic systems around the lake in association with other planned wastewater collection system improvements.

Land Use

Alternative 1A — Lagoon Treatment, Sprinkler Discharge, Additional Spray Field

This alternative would result in a change in land use from 1.2 hectares (3 acres) of natural forest to an aerated sewage storage lagoon. The new spray field would change of 5.3 hectares (13 acres) of natural forest to grassland meadow. Both of these facilities would be fenced to prevent unauthorized access. There would be no change in the land use of the existing spray field, which would continue to be used for application of wastewater and as pasture for Park livestock. The horse/foot trail near the new spray field would need to be relocated.

Alternative 1B — Lagoon Treatment, Sprinkler Discharge, Additional Storage

The preferred alternative would result in a long-term change in land use from 3.6 hectares (9 acres) of natural forest to three sewage lagoons. The change in land use would be near existing facilities. The new lagoons would be fenced to prevent unauthorized access. There would be no change in the land use of the existing spray field, which would continue to be used for application of wastewater and as pasture for Park livestock. The horse/foot trail near the new sewage lagoon would need to be relocated.

Alternative 2 — Advanced Wastewater Treatment Plant, Rapid Infiltration Basin Discharge

Construction of rapid infiltration basins would convert 3.6 hectares (9 acres) of existing natural forest to a series of infiltration basins. The site would be fenced to prevent unauthorized access. The existing spray field would be abandoned, but the meadow would continue to be used as pasture for Park livestock. The horse/foot trail near the new infiltration basins would need to be relocated.

Alternative 3 — Preferred Alternative —Advanced Wastewater Treatment Plant, Land Discharge

A minor change in land use would occur with the construction of new advanced wastewater treatment building. About 56 square meters (600 square feet) of existing parking areas would be used for the new facility. There would be no change in land use associated with construction of an

exfiltration gallery. Temporarily disturbed areas would be revegetated following construction and would remain open for wildlife use.

Alternative 4 — No Action

There would be no change in current land use with the no action alternative. The existing lagoon and spray field would continue to operate as it has in the past. The spray field meadow would continue to be used as pasture for Park livestock.

Cumulative Effects

Each of the action and no action alternatives would have a long-term effect on land use. Proposed facilities are expected to be used for the foreseeable future, although improvements or additions to these facilities are possible in the future.

Local and Regional Economy

All Action Alternatives

Construction of any of the action alternatives would benefit tourism, local communities, and the regional economy. An improved wastewater treatment facility would allow for the continued operation of existing Park facilities, including campgrounds, Apgar lodging and businesses, Lake McDonald Lodge and Park residences, headquarters and operations. Local businesses would benefit from tourist visits. An improved facility would meet anticipated growth as discussed in the General Management Plan (1999) including a new Discovery Center.

Alternatives 1B and 1A could be funded with existing Park Service line item construction allocations for this project. Construction of Alternatives 2 or 3 would require additional Congressional funding. The Park Service Development Advisory Board approved seeking additional funding if Alternative 3 is selected.

Construction contractors and the local economy would benefit from proposed spending over the 2-year construction period for all action alternatives. However, both the direct and indirect benefits would be minimal relative to the local and regional economics. The Park would need to add staff to operate the new wastewater treatment plant. The addition of two employees to operate the new wastewater treatment plant would be a minor effect to the employment base for Alternatives 2 or 3.

Alternative 4 — No Action

Park facilities would continue to operate with the existing WWTP. Inadequate lagoon storage capacity could lead to occasional closure of

some Park facilities and could affect concession operations in the early spring. Adverse economic effects to local businesses are possible if the WWTP is not operational during the tourist season.

Continued operation of the existing WWTP would require annual operating and maintenance costs of at least $26,000. Additional capital expenditures may be necessary to rehabilitate the existing spray field or repair equipment. The existing staff would continue to operate the facility. Additional cleanup costs may be incurred if there is a spill at the lagoon.

Cumulative Effects

All of the action alternatives would result in a long-term beneficial effect to the local and regional economy. An improved wastewater treatment system would meet existing demand and anticipated future demand.

4.3 Relationship Between Local Short-Term Uses and Long-Term Productivity

Short-term uses associated with alternatives under consideration include each of the specific actions necessary to implement a particular alternative. Long-term productivity is construed as the continued existence of the natural resources of the Park at a sustainable and high level of quality so that those natural resources can retain their inherent value and be enjoyed by the public.

The analysis in this FEIS has disclosed impacts from possible short-term uses that would affect long-term productivity as defined. Potential long-term changes in productivity identified in the analysis include:

- The clearing of undisturbed land and loss of natural vegetation and wildlife habitat to construct: additional storage lagoons for Alternatives 1A and 1B; infiltration basins for Alternative 2; and an additional spray field for Alternative 1A.
- The potential loss of several individual state threatened velvetleaf blueberry plants with lagoon construction under Alternatives 1A and 1B.
- A significant long-term improvement in the quality of treated effluent would occur with Alternative 3 and, to a lesser degree, with other action alternatives.

4.4 Irreversible and Irretrievable Commitment of Resources

An irreversible commitment of resources is defined as the loss of future options. The term applies primarily to the effects of non-renewable resources such as minerals or cultural resources, or to those factors such as soil productivity that are renewable only over long periods.

An irretrievable commitment of resources is defined as the loss of production, harvest, or use of natural resources. The amount of production foregone is irretrievable, but the action is not irreversible. If the use changes, it is possible to resume production.

One irreversible commitment of resources under Alternatives 1A or 1B would be the potential loss of individual velvetleaf blueberry plants with construction of sewage lagoons. The excavation of soils for lagoon or infiltration basin construction under Alternatives 1A, 1B, and 2 would be an irreversible loss in soil resources due to the long period of time that would be necessary to restore productivity at those sites.

The proposed action and alternatives prescribe changes from the existing conditions in the project area to construct new wastewater treatment facilities. Construction of sewage lagoons or infiltration basins for Alternatives 1A, 1B, and 2 require forest and vegetation removal. This is an irretrievable commitment of vegetation and timber productivity as well as a loss in wildlife habitat in exchange for the benefit of an improved wastewater treatment facility. The same is true for the construction of an additional spray field for Alternative 1A, although there would be some vegetation production and wildlife values associated with the new spray field. Changes in the scenic or aesthetic value of lands with construction of project facilities would occur for each of the action alternatives based on the level of disturbance.

4.5 Unavoidable Adverse Impacts

Every alternative including the no action alternative would result in some impact. Impacts of each alternative are discussed in Chapter 4 of this DEIS and are summarized in Table 2. Potential unavoidable adverse impacts on physical, biological, and socioeconomic resources are discussed below for each alternative.

To summarize, the preferred alternative and other action alternatives would result in unavoidable minor temporary impacts during construction. No long-term adverse impacts are expected for the preferred alternative and there would be a beneficial impact to water quality. Vegetation clearing needed to construct sewage lagoons, infiltration basins, or an additional spray field under Alternatives 1A, 1B, and 2 would adversely impact native plant communities. Each of these alternatives also would result in a beneficial impact to water quality. Alternatives 1A and 1B would adversely affect less than 10 state threatened velvetleaf blueberry plants.

The no action alternative could adversely impact soil, water, and biological resources if additional sewage lagoon spills occur. Park operations or concession businesses may be adversely impacted if sewage

lagoon capacity is reached and conditions prevent use of the spray field in the spring.

5.0 Consultation and Coordination

An interdisciplinary team of Park biologists, facility managers, engineers, consultants, and MDEQ and Flathead County Health Department representatives conducted preliminary scoping of the project to identify the range of potential alternatives and potential resource issues. Additionally, the U.S. Fish and Wildlife Service, U.S. Forest Service, State Historic Preservation Office, and Jack Stanford, Director of the Flathead Biological Station were consulted.

Two public open houses were held to solicit input from the community on improvements to the wastewater treatment facility. The first open house was held on October 26, 1999 at the West Glacier Community Building. A second open house was held on October 28, 1999 in Kalispell, Montana at the Fish and Wildlife Service Office. Five individuals attended these meetings. Public comments expressed concern about maintaining high water quality and urged the National Park Service to use the best technology available in designing the wastewater treatment system.

The Draft EIS was released for a 60-day public comment period in January 2000. Open houses were held on March 6, 2000 in West Glacier, and on March 8, 2000 in Kalispel following release of the DEIS. No one from the public attended these meetings. A total of 15 comments, of which one included 108 petition signatures, was received. Appendix C includes substantive comments and the Park Service's response. Where appropriate, the text in the FEIS was revised.

The Park will coordinate permitting requirements with the MDEQ, the Flathead County Health Department, the Montana Department of Fish, Wildlife, and Parks, and the Flathead Regional Development Office. The NPS will conduct informal consultation with the U.S. Fish and Wildlife Service and U.S. Forest Service as discussed below.

6.0 Compliance with Federal and State Regulations

The NPS will comply with all applicable federal, state, and local regulations when implementing improvements to the wastewater treatment facility. Regulatory requirements for this project are expected to include the following permits and approvals:

National Environmental Policy Act (NEPA) and Regulations of the Council on Environmental Quality—The National Environmental Policy Act applies to major federal actions that may significantly affect the quality of the human environment. This generally includes major construction activities that involve the use of federal lands or facilities, federal funding, or federal authorizations.

This Environmental Impact Statement meets the requirements of the NEPA and regulations on the Council on Environmental Quality in evaluating potential effects associated with activities on federal lands. A DEIS was released for a 60-day public comment period. This Final EIS was prepared to address the selection of a discharge outlet for the preferred alternative, disclose additional information and address comments received on the DEIS. The NPS will prepare a Record of Decision (ROD) to disclose the decision on the proposed project and any modifications in the selected alternative 30 days after release of the FEIS.

Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.)—Section 7 of the Endangered Species Act is designed to ensure that any action authorized, funded, or carried out by a federal agency likely would not jeopardize the continued existence of any endangered or threatened plant or animal species. If a federal action may affect threatened or endangered species, then consultation with the U.S. Fish and Wildlife Service is required. A Biological Assessment was submitted to the USFWS in April 2000 to address potential effects to federally threatened and endangered species. The NPS determined that the preferred alternative is unlikely to adversely affect threatened or endangered species and is waiting for concurrence from the USFWS on the determination. A Record of Decision will not be signed until the USFWS responds.

Clean Water Act and State and Local Water Quality Regulations— The U.S. Army Corps of Engineers is responsible for authorizing the discharge of dredged or fill materials into waters of the U.S. including wetlands under Section 404 of the Clean Water Act. None of the alternatives, including the preferred alternative, would require a 404 permit because there would be no impact to wetlands or waters of the U.S. (COE 2000).

In compliance with the MDEQ, the Park will submit a site application to construct a WWTP. A Montana Pollution Discharge Elimination System (MPDES) permit would be obtained for treated effluent discharges under the preferred alternative. The MDEQ will determine discharge limitations for the WWTP and consistency with any established TMDL targets for Flathead Lake. A MPDES permit also may be needed for spray field or infiltration discharges of wastewater in Alternatives 1B, 1A, or 2. The State would establish a monitoring program to sample ground water quality below spray fields or infiltration basins for these alternatives. MPDES permitting may not be necessary under the no action alternative.

A MPDES stormwater discharge permit for construction activity would be needed for clearing, grading, and excavating disturbances greater than 2 hectares (5 acres), or greater than 0.4 hectare (1 acre) if within 30 meters (100 feet) of a surface water body. Alternatives 1B and 2 would need a stormwater discharge permit for construction of sewage lagoons or infiltration basins. Alternative 1A would need a stormwater discharge permit to construct an additional spray field. Alternative 3 may require a stormwater discharge permit for construction of the exfiltration gallery.

Executive Order 11988, Floodplain Management—This order requires all federal agencies to avoid the construction of certain types of facilities in 100-year and 500-year floodplains unless no other practical alternatives exist. No new facilities would be located within the floodplain for Alternatives 1A, 1B, or 2. The existing spray field would remain within the floodplain of lower McDonald Creek and the Middle Fork of the Flathead River under Alternatives 1A, 1B, and the no action alternative. For the preferred alternative (Alternative 3), a discharge outlet would be located in the lower McDonald Creek and Middle Fork of the Flathead River 100-year floodplain, but there would be no obstructions located in the floodplain that would increase the risk for flooding. The preferred alternative is an exception under E.O. 11988 because it is functionally dependent upon a location in proximity to water. As discussed below, a floodplain permit from the Flathead Regional Development Office would be needed to construct the exfiltration gallery.

Montana Floodplain and Floodway Management Act—The Montana Department of Natural Resources or local floodplain administrator regulates construction activities in the 100-year floodplain. In Flathead County, the Flathead Regional Development Office is responsible for administering this program. Alternatives 1A, 1B, and 2 would not require construction of any new facilities in the 100-year floodplain, although the existing spray field in the floodplain would continue to be used for Alternatives 1A and 1B. The exfiltration gallery discharge site for the preferred alternative (Alternative 3) would be located in the 100-year

floodplain. The Park would apply for a Floodplain Development Permit for construction of the proposed discharge outlet.

Wild and Scenic River Act—In 1976, Congress designated the North Fork and Middle Fork of the Flathead River as a part of the national Wild and Scenic River system. The Middle Fork is designated as "recreational" for the entire length bordering Glacier National Park. The Middle Fork of the Flathead River is jointly administered by the Forest Service and the NPS under the Wild and Scenic Rivers Act. In accordance with Section 7(b) of the Wild and Scenic Rivers Act (16 U.S.C.), the administering agency of the river is responsible to determine if a "water resources project" has "direct and adverse" effects on the values for which a river is recommended for designation. The preferred alternative would not have a direct and adverse effect for which the Middle Fork of the Flathead River was designated as a Wild and Scenic River. Land discharge of treated effluent under Alternative 3 would not require submission of a Section 7(b) determination to the U.S. Forest Service.

Executive Order 11990, Protection of Wetlands—This order requires federal agencies to avoid, where possible, impacts to wetlands. No wetlands would be affected by the preferred or alternative actions. This will be verified by the U.S. Army Corps of Engineers prior to construction.

National Historic Preservation Act of 1966, as amended (16 U.S.C. 470, et. seq.)— Section 106 of the National Historic Preservation Act of 1966 (as amended) requires all federal agencies to consider effects from any federal action on cultural resources eligible for or listed on the National Register of Historic Places (NHRP), prior to initiating such actions. The preferred alternative would not affect any known cultural resources eligible for NHRP listing and would not be considered an "undertaking" that would require Section 106 review (Montana State Historic Preservation office, Appendix C).

7.0 List of Agencies, Organizations, and Persons Receiving the Final EIS

Public officials, agencies, and organizations that received the draft and the final environmental impact statement for the Lake McDonald/Park Headquarters wastewater treatment system rehabilitation are listed in this section.

Elected Officials

Max Baucus, United States Senate
Conrad Burns, United States Senate
Glacier County Commissioner's
Howard Gipe, Chair, Flathead County Board of Commissioners
Rick Hill, United States House of Representatives
Fred Matt, Chair, Confederated Salish and Kootenai Tribal Council
William Old Chief, Chair, Blackfeet Tribal Business Council
Marc Racicot, Governor of Montana

Federal Agencies

Department of Interior, Office of the Solicitor, Billings
U.S. Army Corps of Engineers
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service, Crestwood Office
U.S. Fish and Wildlife Service, Field Director, Helena
U.S. Forest Service

Canadian Government Agencies

Waterton Lakes National Park

State and Provincial Agencies

Montana Department of Environmental Quality
Flathead County Department of Health
Montana Department of Natural Resources and Conservation
Flathead Regional Development Office
Montana State Historic Preservation Office, Helena
Montana State Clearinghouse, Helena
Montana Department of Fish, Wildlife and Parks, Helena
Office of the Solicitor, Billings

Organizations

Browning Public County Library
Coalition for Canyon Preservation
Columbia Falls Branch Library
Cut Bank Library
Flathead County Library
Glacier National History Association
Glacier Park Associates
Glacier Park, Inc.
Glacier-Waterton National Parks Visitor Association
Great Falls Public Library
Missoula Public Library
Montana Wilderness Association
National Parks Conservation Association
Whitefish Branch Public Library
Wilderness Society, Northern Rockies Regional Office

A complete listing of agencies, organizations, public officials, and individuals to whom a copy of the draft and final *Environmental Impact Statement for the Lake McDonald/Park Headquarters Wastewater Treatment System Rehabilitation* was sent is on file at Glacier National Park.

8.0 References

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9.0 List of Preparers

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Richard Menicke, GIS Specialist, Glacier National Park
Rick Yates, Biological Technician, Glacier National Park

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APPENDIX A

COMMON AND SCIENTIFIC NAMES OF PLANTS AND ANIMALS REFERENCED IN THE ENVIRONMENTAL IMPACT STATEMENT

Common Name	Scientific Name
Animals, Birds, Reptiles, Amphibians and Fish	
American dipper	*Cinclus mexicanus*
Bald eagle	*Haliaeetus leucocephalus*
Barred owl	*Strix varia*
Barrow's goldeneye	*Bucephala islandica*
Beaver	*Castor canadensis*
Belted kingfisher	*Ceryle alcyon*
Black bear	*Ursus americanus*
Black–capped chickadee	*Poecile atricapillus*
Black-headed grosbeak	*Pheucticus melanocephalus*
Brook trout	*Salvelinus fontinalis*
Bufflehead	*Bucephala albeola*
Bull trout	*Salvelinus confluentus*
Canada goose	*Branta canadensis*
Chestnut-backed chickadee	*Poecile rufescens*
Columbian ground squirrel	*Spermophilus columbianus*
Common crow	*Corvus brachyrhynchos*
Common goldeneye	*Bucephala clangula*
Common yellowthroat	*Geothlypis trichas*
Cooper's hawk	*Accipiter cooperii*
Coyote	*Canis latrans*
Dark-eyed junco	*Junco hyemalis*
Elk	*Cervus elaphus*
Fisher	*Martes pennanti*
Fox sparrow	*Passerella iliaca*
Golden eagle	*Aquila chrysaetos*
Golden-mantled ground squirrel	*Spermophilus lateralis*
Gray wolf	*Canis lupus*
Great horned owl	*Bubo virginianus*
Great blue heron	*Ardea herodias*
Grizzly bear	*Ursus arctos horribilis*
Harlequin duck	*Histrionicus histrionicus*
Hairy woodpecker	*Picoides villosus*
Hooded mergansers	*Lophodytes cucullatus*

Common Name	Scientific Name
Killdeer	*Charadrius vociferus*
Kokanee salmon	*Oncorhynchus nerka*
Lake trout	*Salvelinus namaycush*
Least weasel	*Mustela nivalis*
Longnose dace	*Rhinichthys cataractae*
Long-tailed weasel	*Mustela frenata*
Lynx	*Lynx canadensis*
Marten	*Martes americana*
Mink	*Mustela vison*
Mountain lion	*Felis concolor*
Mountain whitefish	*Prosopium williamsoni*
Mule deer	*Odocoileus hermionus*
Muskrat	*Ondatra zibethicus*
Northern flicker	*Colaptes auratus*
Northern goshawk	*Accipiter gentilis*
Northern pygmy owl	*Glaucidium gnoma*
Northern saw-whet owl	*Aegolius acadicus*
Osprey	*Pandion haliaetus*
Peregrine falcon	*Falco peregrinus*
Pileated woodpecker	*Dryocopus pileatus*
Pine siskin	*Carduelis pinus*
Pygmy whitefish	*Prosopium coulteri*
Rainbow trout	*Oncorhynchus mykiss*
Red-tailed hawk	*Buteo jamaicensis*
Red-winged blackbird	*Agelaius phoeniceus*
River otter	*Lutra canadensis*
Ruby-crowned kinglet	*Regulus calendula*
Rufous hummingbird	*Selasphorus rufus*
Sharp-shinned hawk	*Accipiter striatus*
Short-tailed weasel	*Mustela erminea*
Snowshoe hare	*Lepus americanus*
Spotted sandpiper	*Actitis macularia*
Striped skunk	*Mephitis mephitis*
Tree swallow	*Tachycineta bicolor*
Trumpeter swan	*Cygnus buccinator*
Tundra swan	*Cygnus columbianus*
Warbling vireo	*Vireo gilvus*
Western tanager	*Piranga ludoviciana*
Westslope cutthroat trout	*Oncorhynchus clarki lewisi*
White sucker	*Catostomus commersoni*

Common Name	Scientific Name
White-tailed deer	*Odocoileus virginianus*
Willow flycatcher	*Empidonax traillii*
Wolverine	*Gulo gulo*
Wood duck	*Aix sponsa*
Yellow warbler	*Dendroica petechia*
Yellowstone cutthroat trout	*Oncorhynchus clarki bouvieri*
Plants	
American vetch	*Vicia americana*
Baldhip rose	*Rosa gymnocarpa*
Beargrass	*Xerophyllum tenax*
Big chickweed†	*Cerastium vulgatum*
Black cottonwood	*Populus trichocarpa*
Black hawthorne	*Crataegus douglasii*
Blake Prince's pine	*Chimaphila umbellata*
Blue wildrye	*Elymus glaucus*
Blueleaf strawberry	*Fragaria virginiana*
Bracken fern	*Pteridium aquilinum*
Bull thistle†	*Cirisium vulgare*
Bunchberry	*Cornus canadensis*
Canada violet	*Viola canadensis*
Chokecherry	*Prunus virginiana*
Christmas tree moss	*Polytrichum juniperinum*
Common dandelion†	*Taraxacum officianale*
Common horesetail	*Equisetum arvense*
Common plantain†	*Plantago major*
Common scorpion-grass†	*Myosotis scorpioides*
Common snowberry	*Symphoricarpos albus*
Common timothy†	*Phleum pratense*
Cow-wheat	*Melampyrum lineare*
Crawford's sedge	*Carex crawfordii*
Darkwoods violet	*Viola orbiculata*
Douglas fir	*Pseudotsuga menziesii*
Dwarf rattlesnake -plantain	*Goodyera oblongifolia*
Engelmann spruce	*Picea engelmannii*
English plantain†	*Plantago lanceolata*
Feather moss	*Hylocomium splendens*
Field pussy-toes	*Antennaria neglecta*
Fireweed	*Epilobium angustifolium*
Fool's huckleberry	*Menziesia ferruginea*
Goldenrod	*Solidago* spp.

Common Name	Scientific Name
Grand Fir	*Abies grandis*
Grouseberry	*Vaccinium scoparium*
Harebell	*Campanula rotundifolia*
Heart-leaf arnica	*Arnica cordifolia*
Heart-leaf twayblade	*Listera cordata*
Hop clover†	*Medicago lupulina*
Kentucky bluegrass†	*Poa pratensis*
Lady fern	*Athryrium filix-femina*
Large-leaved avens	*Geum macrophyllum*
Little buttercup	*Ranunculus uncinatus*
Lodgepole pine	*Pinus contorta*
Mountain sweet-cicely	*Osmorhiza chilensis*
Ocean-spray	*Holodiscus discolor*
Oregon grape	*Mahonia repens*
Ox-eye daisy†	*Leucanthemum vulgare*
Paper birch	*Betula papyrifera*
Pathfinder	*Adenocaulon bicolor*
Paul's betony†	*Veronica officianalis*
Pearly everlasting	*Anaphalis margaritacea*
Pinedrops	*Pterospora andromedea*
Pinegrass	*Calamagrostis rubescens*
Pink wintergreen	*Pyrola asarifolia*
Quaking aspen	*Populus tremuloides*
Queen's cup	*Clintonia uniflora*
Red clover†	*Trifolium pratense*
Red raspberry	*Rubus idaeus*
Redtop†	*Agrostis stolonifera*
Red-osier dogwood	*Cornus stolonifera*
Rosy pussy-toes	*Antennaria microphylla*
Rough-leaf ricegrass	*Oryzopsis asperifolia*
Round-leaved rein-orchid	*Habenaria orbiculata*
Scared cat-tail moss	*Rhytidiadelphus triquestrus*
Sedge	*Carex* spp
Self-heal†	*Prunella vulgaris*
Serviceberry	*Amelanchier alnifola*
Shiny-leaf spiraea	*Spirea betulifolia*
Silvery cinquefoil†	*Potentilla argentea*
Sitka alder	*Alnus sinuata*
Small bedstraw	*Galium trifidum*
Solomon's-plume	*Smilacina stellata*

Common Name	Scientific Name
Spotted knapweed†	*Centaurea maculosa*
Spreading dogbane	*Apocynum androsaemifolium*
St. John's wort†	*Hypericum perforatum*
Streambank butterweed	*Senecio pseudaureus*
Striped coral-root	*Corallorhiza striata*
Sweep's brush	*Luzula campestris*
Tall huckleberry	*Vaccinium membranaceum*
Thimbleberry	*Rubus parviflorus*
Thyme-leaved speedwell†	*Veronica serpyllifolia*
Trappers tea	*Ledum glandulosum*
Trefoil-foamflower	*Tiarella trifoliata*
Twinflower	*Linnaea borealis*
Upland larkspur	*Delphinium nuttallianum*
Velvetleaf blueberry	*Vaccinium myrtilloides*
Western hemlock	*Tsuga heterophylla*
Western larch	*Larix occidentalis*
Western red cedar	*Thuja plicata*
Western white pine	*Pinus monticola*
White –flowered hawkweed	*Hieracium albiflorum*
White lady-slipper	*Cypripedium montanum*
Wild sarsaparilla	*Aralia nudicaulis*
Willow	*Salix* spp.
Woods strawberry	*Fragaria vesca*
Yarrow	*Achillea millefolium*
Yellow coral-root	*Corallorhiza trifida*

†Non-native

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APPENDIX B

BIOLOGICAL ASSESSMENT

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APPENDIX C

COMMENTS AND RESPONSES ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT

Included in this Appendix is a copy of the letters with substantive comments on the Draft EIS. These letters were received from federal and state agencies, organizations and individuals. Beside each reproduced letter is the response of the National Park Service to those comments. Comments, as defined in NPS-12:NEPA Compliance Guideline, are considered substantive if they:

- Question, with reasonable basis, the accuracy of the information in the document
- Question, with reasonable basis, the adequacy of the environmental analysis
- Present reasonable alternatives other than those presented in the environmental impact statement
- Cause changes or revisions in the proposal

Where appropriate, the text in the Final EIS has been revised in response to these comments.

Summary of Common Concerns

The public comments on the draft Environmental Impact Statement expressed several common concerns. Some members of the public questioned why the existing capacity was not being increased to accommodate perceived increases in sewage due to the West Side Discovery Center and adding private homes along Lake McDonald to the system. The analysis conducted by RTW indicated that although the current treatment system was designed to operate at a peak capacity of 250,000 gallons per day, peak recorded WWTP inflows were still less than 65 percent of capacity. Their analysis further indicated that if the system could be rehabilitated to operate at 250,000 gallons, and that this capacity would be enough to accommodate the West Side Discovery Center and the addition of private inholders along Lake McDonald.

Many members of the public also were very concerned about the proposal to pipe the treated effluent to the Middle Fork of the Flathead River due to its status as a Wild and Scenic River and the perception that the National Park Service was dumping sewage into the river, despite the level of treatment the water was receiving. In response, the National Park Service has selected the exfiltration gallery system as its preferred alternative for discharge of the treated effluent. This method would pipe the treated

effluent to a location about 30 meters (100 feet) from the river. The effluent would be dispersed into the ground below the surface. The effluent would pass through a concrete box before being released into the ground where it would then filter down through gravel and sand before entering the ground water system. The exfiltration would be located entirely below the ground surface and would not affect flooding hazard.

Many members of the public who commented also strongly suggested that the Park consider using a constructed wetland or cattail pond to treat and distribute the treated effluent. An evaluation of this method concluded that a constructed wetland would not improve the quality of the treated discharge. A wetland would only be functional during a relatively short growing season, and wide fluctuations in discharge to a wetland would make it difficult to size and efficiently operate a wetland system. In addition, a wetland would require greater disturbance and a change in the natural habitat.